Technical Analyses of Flood Projects for Safe, Clean Water Program 2012

Memo and Appendix A-K

Vol 1

Santa Clara Valley Water District

MEMORANDUM

TO: Safe, Clean Water Team

FROM: Sara Duckler, Senior Engineer
Edward Drury, Associate Engineer

SUBJECT: Technical Analyses and Screening of Potential Flood Capital Projects for Safe, Clean Water Program

DATE: November 2, 2011

A list of capital flood projects potentially fundable by the Safe, Clean Water (SCW) program was developed and subdivided into three categories:

(1) Clean Safe Creeks 2000 projects (CSC) that require additional time to complete beyond the start of SCW
- The SCW program would replace the CSC program in 2013, which is three years prior to the original sunset date of the CSC program.
- SCW would continue funding for these remaining capital projects.
- These projects were confirmed in the Capital Improvement Plan (CIP) and with Senior Project Managers to verify schedule and costs for financial planning of the SCW program.

(2) Ongoing capital projects that would benefit from SCW funding to accelerate results
- Existing, non-CSC projects were evaluated for inclusion in the program based on: readiness-to-proceed, defined benefits of the project, and cost.
- These ongoing projects were confirmed in the CIP and with senior project managers to verify schedule and costs.

(3) New Capital projects
- These projects were screened based on estimated flood risk (number of parcels at risk and estimated damages from flooding), construction cost, and feasibility of implementing a solution within the timeframe of the Safe, Clean Water program.

All appropriate projects from category (1) will be included in the Safe, Clean Water program. To evaluate and compare potential new projects from categories (2) and (3) several analyses were completed, using existing best-available data. This memorandum summarizes information gathered and analyses performed to better understand and prioritize the potential projects in categories (2) and (3). A master table summarizing the quantitative findings for each creek reach is presented in Table 1, an attachment to this memorandum. Appendix A summarizes the findings and decisions made relative to each creek in text form. Key findings, data developed in the course of investigating the projects, summaries and analyses are presented in Appendices B – L to this document. Appendix L, Hydraulic Analyses Materials, is bound separately.

Flood Protection and Stream Stewardship Master Plan, Chapter 4: Needs and Opportunities
A list of candidate (new) capital projects was drawn from Chapter 4, "Needs and Opportunities" of the district's Flood Protection and Stream Stewardship Master Plan released in November, 2010. Waterways from every watershed were highlighted in Chapter 4 because of their flooding potential. A reprint of Chapter 4 is provided in Appendix B. The full document can be downloaded from

www.valleywater.org/Services/FloodProtectionMasterPlan.aspx . The candidate projects named in Chapter 4 provided the initial candidate list for the Safe, Clean Water program's flood capital program. These projects were defined, screened, assessed and refined as part of the selection process.

Project Descriptions

To understand and organize potential capital projects, the engineering team developed brief overview descriptions for the candidate projects outlined in Chapter 4, with the assistance of capital project engineers. The project descriptions included a short description of the flooding problem and other relevant information pertinent to potential capital work. Rough costs were estimated for prospective flood protection capital work and benefits of doing project work were described, if information was available. As the project list was further screened and ideas were refined, more detailed descriptions were developed. Project descriptions for the set of five capital projects under consideration in October, 2011 are presented in Appendix C1. The descriptions for the original set of 17 projects considered can be found in Appendix C2. (*Note: the project list would continue to evolve over time; however, analyses by the engineering team did not occur beyond September 2011).*

Defining 1% Floodplain and Parcel Counts

The number of parcels subject to flooding from identified creek reaches was the initial screen for advancing potential projects. Most reaches had been previously calculated, but higher-value reaches were re-calculated for this effort. We used two sources of floodplain information: FEMA-published 1% digital flood insurance rate maps (DFIRMs) and the 1% shallow (less than one foot) floodplain maps maintained by the Santa Clara Valley Water District. The unpublished source for the shallow flood maps was the FEMA contractor's 1980's modeling of overflows, which the District kept and maintained, first on paper and later digitally. At the time of the original FEMA study, the district retained this information as locally-valuable, although FEMA does not map or regulate areas subject to less than one foot of flooding.

Maps of floodplains as attributed to specific creek reaches are available in Appendix D, coupled with the related economic analyses described below. Engineers used the District's Geographic Information System (GIS) to estimate the number of parcels subject to flooding from a specified creek reach. These numbers are approximate, used for comparisons and screening purposes only. A more detailed calculation for specific project attributes would require a more intensive analysis, which was not a part of this investigation. Screening-level parcel counts are provided in Table 1. Creek reaches with high parcel counts were further analyzed for possible inclusion in the Safe, Clean Water program, as described in this memorandum.

Hydrology

The District's Hydrology, Hydraulics and Geomorphology Unit develops and makes available the most up-to-date hydrologic data on Santa Clara County creeks and waterways. To ensure that technical analyses for this effort were based on best-available data, the engineering team requested hydrologic information for the following creeks: Alamitos, Calera, Canoas, and San Tomas Aquino (from the Union Pacific Railroad crossing to Williams Road). These are creek reaches that, through the screening process, merited a closer look to define flooding issues. The requests and data received are provided in Appendix E.

Hydraulic Analysis: HEC-RAS

To better understand the scale of flooding problems and possible solutions, the engineering team ran basic hydraulic analyses on key candidate creek reaches where existing hydraulic models were available. The US Army Corps of Engineers (USACE) Hydrologic Engineering Center- River Analysis System-(HEC-RAS) is a model that allows the user to perform one dimensional steady and unsteady flow hydraulic calculations. It is used to compute water surface elevations along a waterway and flooding from a specified flow event. The hydrology used in these simulations was the most current and best-available, as described above. The HEC-RAS model was used to test for sensitivity to bridges, to confirm flooding problems and/or to investigate how much additional levee height would be

needed to meet FEMA 1% flood-protection criteria. HEC-RAS was run for Alamitos, Calera, Canoas and San Tomas Aquino Creeks as described below:

Alamitos

- For background and comparisons, we ran both the published FEMA 1% flows and the best-available flows as provided by the Hydrology, Hydraulics and Geomorphology unit, which were the 2009 COE-published flows (Appendix E).
- The model was used to identify the location, severity and extent of freeboard shortfalls in meeting FEMA levee criteria.
- The model was used to identify the location and severity of bridge conveyance issues.
- The findings were used to determine approximate real estate requirements and construction quantities to construct additional levees to meet the FEMA criteria.

Findings were used to shape conceptual project proposal and cost estimate for Alamitos Creek, from Lake Almaden to Harry Road in San Jose, as provided in Appendix J.

Calera

- For background and comparisons, we ran both the published FEMA 1% flows and the best-available flows as provided by the Hydrology, Hydraulics and Geomorphology unit (Appendix E).
- We used the model provided by the Lower Berryessa study team (modified and updated in 2010 by the consultants to the Lower Berryessa study, Winzler & Kelly).
- The model was run to confirm the effectiveness of the preliminary Calera Creek design proposed by the consultant team on the Lower Berryessa project for Calera Creek, a tributary to Lower Berryessa.

Findings were used to confirm the conceptual project proposal and cost estimate as provided in Appendix J, as developed by consultants Winzler & Kelly for the Lower Berryessa Team. The cost estimate was updated using actual costs from recent similar bids for District projects.

Canoas

- For background and comparisons, we ran the published FEMA 1% flows, the SCVWD "green book" flows and the most-current flows as provided by the Hydrology, Hydraulics and Geomorphology unit, which are the 2009 Corps-published flows (Appendix E).
- We used the HEC-RAS model provided by District capital staff, updated in 2009 for a separate project, as provided by senior engineer Liang Xu.
- The model was used to identify the location, severity and extent of 1% freeboard shortfalls.
- The model was used to identify the location and severity of bridge conveyance issues.
- The model showed that the 2009 COE-published 1% flows, in combination with improvements expected as part of the Upper Guadalupe project, will produce little or no flooding.

San Tomas Aquino

- For background and comparisons, we ran the published FEMA 1% flows, the SCVWD "green book" flows and the most-current flows as provided by the Hydrology, Hydraulics and Geomorphology unit
- We used the HEC-RAS model available for download, labeled "Current" for the study reach, Railroad crossing to Williams Road; files no. 2109004 and 2109005.
- The model was used to verify that capacity issues were not due solely to the hydraulic capacity of the long box-culvert entrance at Williams Road
- The model verified that the long box culvert itself (approximately 3 miles long) does not have 1% flow capacity.

Summary results from these HEC-RAS analyses are provided in Appendix F. Notes, data and other background material, model runs and outputs are also available in Appendix L, Hydraulic Analyses Materials, which is bound separately from this document.

Economic Calculations

Hazus-MH: FEMA's Economic Loss Model

The Hazards U.S. Multi-Hazard Model (Hazus) is a regional multi-hazard loss estimation tool that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to estimate multi-hazard losses at a regional scale. These loss estimates can be used by local, state and regional officials to plan and support efforts to reduce risks from multiple natural hazards and to prepare for emergency response and recovery.

As part of the Safe, Clean Water programming effort, Hazus was used to estimate the economic losses from a 1% flood event for high-priority creek reaches in Santa Clara County. Reaches were selected for modeling with Hazus based on the estimated number of parcels subject to 1% flooding. Areas with over 1,000 parcels in the 1% floodplain or areas associated with continuation of existing studies were selected for analysis. The floodplains analyzed were delineated from published digital FEMA maps (2009 DFIRMs) and on additional digital maps maintained by the Santa Clara Valley Water District that plot areas subject to shallow (less than 1' deep) flooding, as described above. For modeling purposes, shallow flooding areas were assumed to flood to a depth of 0.8' and FEMA-mapped areas were assumed to flood to a depth of 1.0' unless better information was available. In the future, more detailed hydraulic studies may adjust the shape or size of the associated floodplain; in these cases the economic analysis may be revised.

Hazus generates a report for each run; these are included in Appendix D of this document. Maps illustrating the area and depths of flooding modeled for the 1% event are also included in Appendix D for each reach modeled. The expected damages calculated by Hazus for a 1% flood are reported in Table 1.

Corps Economic Values

Some Corps studies include an economic analysis. The Corps methodology generally represents a more detailed and extensive level of analysis than Hazus produces. Where available, the Corps economic values have been reported in Table 1; these instances are noted. Specifically, 1% damages and average annual damages from Corps studies have been reported in Table 1 for San Francisquito Creek and Upper (Upper) Berryessa Creek (Upstream of Highway 680).

Average Annual Damages

Economic benefits are based on the average annual damages that would be averted during the lifetime of a project, typically 50 years. A precise assessment of average annual damages would require a complicated hydraulic and economic analysis. For this effort, a consistent and simplified methodology was employed to estimate average annual damages. The calculation is based on the 1% damages and frequency of flooding. The best available information for frequency of flooding is from a mid-1980's to mid-1990's District study, the Waterways Management Study, which collected asset-based information into the (no longer supported) Waterways Management Model. The study estimated, collected and catalogued the flood frequencies of specific creek reaches. This information has not been updated comprehensively since the mid-1990's; however the information can be used for such broad-brush purposes as this effort. The method used to calculate average annual damages from 1% damage estimates and flood frequency was documented in the 1983 Santa Clara Valley Water District Waterways Planning Study (Chapter 2, Flooding and Flood Damages). The full report is available in the SCVWD Library. An excerpt from the original report that describes the methodology and equations for average annual damages is provided in Appendix G of this document. Calculated average annual damages, and the flood frequency on which they are based, are provided for specific creek reaches in Table 1 of this document.

CIP Score
The district produces a rolling 5-year Capital Improvement Plan (CIP), updated annually. Projects are scored and promoted in the CIP according to specified criteria, including average annual flood damages, developed acres at risk of flooding, flood insurance costs, historical flooding, potential for environmental or social benefits of a project, and other criteria. These criteria scores are combined into a CIP Priority Score via a standard weighted calculation.

The CIP Priority score was a significant factor in the screening and prioritization for this Safe, Clean Water program development. For this analysis, a CIP score was collected, created or updated for individual candidate projects. Projects that merited an updated CIP score included: Alamitos, Calera, and Canoas. Appendix H provides the scoring sheets and explanatory memoranda for these projects. It also provides a list of projects and scores from the current, 2012 CIP. Table 1 includes a column that provides the existing or updated CIP score for each relevant creek reach.

Benefit:Cost Ratio
In the past, the District has not calculated a benefit to cost (B:C) ratio for capital projects. Priority for capital work has been based on the need for relief from flooding: "Determining priority to initiate a flood protection project is based on a number of factors, but the primary factor is the estimated average annual flood damages prevented by the project." – Marc Klemencic, former Chief Operating Officer, Watersheds.

For the Safe Clean Water planning effort, an approximate B:C ratio was desired as a supplemental means of evaluating the worthiness of potential capital projects. The calculated benefits, as described above (average annual damages averted), account only for estimated flood damage reduction benefits in economic terms, but do not account for environmental, recreation and aesthetic benefits that may also result from a natural flood protection project. These types of benefits are not straightforward to monetize, and are therefore not included in the B:C. On the other side of the equation, cost estimates include flood protection as well as the estimated costs for essential environmental, recreation and aesthetic components. For this reason, the B:C is not a technically accurate reflection of the true benefits and costs, but an economically conservative measure of the basic economics of a project.

The simplified B:C calculation used for this effort assumes a 50-year project lifespan and an interest rate of 5% on the total project costs. Annual operations and maintenance costs were not included in the calculation because the district performs annual inspection and maintenance activities on most or all of the candidate creeks already, and the costs for these activities would not change significantly.

The simplified B:C is calculated as:

$$B{:}C = \frac{\text{(Avg Annual Flood Damages Averted)}}{\text{(Annualized project capital cost amortized over 50 years at 5\% interest rate)}}$$

The simplified B:C is presented in Table 1.

Removed from Consideration
During the course of evaluations, two creeks which had initially looked promising were removed from further consideration for specific and documentable reasons. Canoas creek, upon analysis with updated 2009 hydrology (provided by the Corps and verified by the district's Hydrology, Hydraulics and Geomorphology Unit) was found to have a relatively small 1% flood problem, as compared to the previously-attributed floodplain of nearly 10,000 parcels. The exception is a relatively small area near the confluence with the Upper Guadalupe River, which will be addressed during the construction of that Corps/SCVWD project. A new CIP score was proposed based on the updated finding, and a memorandum was developed to describe the change in score. These are located in Appendix H. The updated Corps 2009 hydrology is provided in Appendix E. A project on Canoas was removed from

further consideration based on the above findings. A brief memorandum documenting these findings is included in Appendix I.

San Tomas Aquino Creek, between the Union Pacific Railroad and Williams Road was also removed from further consideration upon more detailed study, although approximately 5,000 parcels are subject to flooding of roughly 1 foot depth in this area. While calculated economic damages for this floodplain are quite high, the impediments to improving this reach to convey the 1% flow indicate it is not feasible to fund a capital project nor to expect one to be feasible during the 15-year window of the Safe, Clean Water program. A memorandum documenting these findings is included in Appendix I.

New Project Proposals
Candidate projects emerged from the screening efforts described above. Conceptual plans including preliminary cost estimates were developed for the most promising new projects. Developing preliminary cost estimates required more detailed analyses to outline specific protective measures and to determine additional right-of-way costs, which is a significant component of most capital projects. Conceptual plans and preliminary cost estimates for the most promising candidate projects were assembled into project proposals, following the district's ISO/QEMS Project Proposal Template W72102, with additional attachments for drawings, sketches, hydraulic analyses and cost-estimates. Proposals were prepared for Alamitos, Calera, Upper (Upper) Berryessa (Upstream of Highway 680), Mid-Coyote, and Upper Permanente projects. The proposals and cost estimates are provided in Appendix J.

Conclusion
As of October 31 2011, only category (1) and (2) projects are proposed for capital funding in the SCW program. A few category (3) projects are proposed as engineering studies only, to better define the flooding problem and possible technical solutions. The proposed studies do not include environmental work, with the understanding that it may be several years before capital work could be funded and environmental work may be out of date by that time. Appendix K provides the list of capital flood protection projects proposed for funding in the Safe, Clean Water Program's "Community Supported Plan" as of October 31, 2011.

Attachments:
List of Attachments and Appendices
Table 1 – Summary of Technical Findings on Candidate Capital Projects
Appendices A – K
Appendix L, bound separately

Attachments and Appendices
Technical Analyses and Screening of Potential Flood Capital Projects

Attachment	Contents	Notes
Table 1	Summary Table of Technical Findings on Candidate Capital Projects	1% flood-prone parcel counts; 1% Damages; Frequency of Flooding; Avg. Annual Damages; CIP Score; Estimated Project Cost; Economic B:C

Appendix	Contents	Notes
A	Summary of Findings and Status for Candidate Creek Reaches (As of October 31, 2011)	Brief description of the findings and decisions regarding whether to proceed with specific creek reaches as capital projects in the Safe, Clean Water program. Program may continue to evolve after October 31, 2011
B	Flood Protection and Stream Stewardship Master Plan 2010, Chapter 4 "Needs and Opportunities"	Full report available at: www.valleywater.org/Services/FloodProtectionMasterPlan.aspx
C	Brief Descriptions of Candidate Capital Flood projects	Appdx C1: Candidate Capital Flood Project Element Description Forms (as of 10/31/11) Appdx C2: Project Descriptions, assessed between February – August 2011; these projects may not have proceeded within selection process
D	Economic Damage Modeling & 1% Floodplain Maps	HAZUS-MH model results and maps of analyzed areas
E	Hydrology	Requests and responses for Hydrology (1% flows) for candidate capital flood projects
F	Hydraulic Analyses, Results	HEC-RAS Model results for Analyzed Creeks: Alamitos, Calera, Canoas, and San Tomas Aquino
G	Average Annual Damages - Calculation Methodology	Excerpt from Chapter 2 of 1983 SCVWD Waterways Planning Study
H	Revised CIP Scoring Sheets	CIP scores were revised or created for four candidate creek reaches. Scores for other reaches that were previously scored can be seen in Table 1
I	Memoranda of Specific Findings - Canoas and San Tomas Aquino Creeks	Memoranda describing findings and recommendations to not proceed with Canoas and San Tomas Creeks
J	New Capital Project Proposals	Upper (Upper) Berryessa, U/S 680 Alamitos Creek - not approved Calera Creek - not approved Upper Permanente - not approved Mid-Coyote R6 - 8b - not approved
K	Proposed Capital Natural Flood Protection Projects for Safe, Clean Water program (Goal 5)	List of proposed projects and funding level, as of October 31, 2011
L	Details of Hydraulic Analyses (Bound Separately)	HEC-RAS Model input and outputs, data and background information for San Tomas Aquino, Alamitos, Calera and Canoas Creeks

Table 1: Summary of Technical Findings on Candidate Capital Projects

All Calculations Were Made for Internal Screening/ Comparison Purposes Only

All Costs Shown in $1,000s

Watershed	Category	Creek (Reach)	City	Appx. No. Parcels in 1% floodplain	1% Damages (HAZUS, unless otherwise noted) Ref (1)	Flood Return Period (yrs) Ref (2) WWMM	C for Avg Annual Dmgs Ref (3)	Avg Annual Damages Ref (4)	CIP Score Ref (5)	Total Project Cost (Est.)	Estd SCW Project Cost (post CSC)	Prelim B:C Ratio Ref (6)	Notes
Guadalupe	1	**Upper Guadalupe** (Hwy 280 to Blossom Hill Rd.)	**San Jose**	8,400	$ 363,600	20	0.5	$ 9,100	**77**	?	$ 120,988		est'd - verify w/Corps report
Pajaro	1	**Upper Llagas Creek** (Morgan Hill, Buena Vista Ave. to Wright Ave. and W. Little Llagas)	**Morgan Hill**	1,000	$ 63,500	5	0.3	$ 2,600	**66**	?	$ 85,600		Parcel count from 2011 GIS estimate, based on CSC 2000 floodplain map. Flood return pd. est'd from dashboard
Coyote	1	**Upper Berryessa - Corps Proj.** (Calaveras Blvd. to 680) **HAZUS Analysis on FEMA/ CSC Floodplain**	**Milpitas**	1,900	$ 119,000	20	0.5	$ 3,000	**53**	?	$ 20,000		est'd - verify w/Corps report
Lower Peninsula	2	**(Upper) Permanente** (Mt. View, U/S El Camino)	**Mountain View**	698	$ 6,500	90	1	$ 100	**94 (combined w/lower Perm.)**	$ 20,000	$ 20,000	0.09	
Lower Peninsula	2	**San Francisquito Creek- Full Project** (Full Project, SF Bay to Searsville Dam- BOTH SIDES - Santa Clara Co. and San Mateo Co.) **Econ is from COE Analysis June 2011 Econ Report**	**Palo Alto**	3,300	$ 303,531	12	0.45	$ 10,986	79	$ 128,000	$ 53,000	1.57	
Lower Peninsula	2	**San Francisquito Creek** (downstream Hwy 101 - BOTH SIDES - Santa Clara Co. and San Mateo Co.) **Econ is from COE Analysis June 2011 Econ Report**	**Palo Alto**	50	$ 161,695	12	0.45	$ 5,739	79	$ 25,000	$ 12,500	4.19	
Coyote	2	**Mid-Coyote - partial** (Reaches 6 – 8b of CSC study– Highway 880 to Berryessa Rd.)	**San Jose**	130	$ 34,800	2.8	0.25	$ 1,900	**59**	$ 38,238	$ 38,238	0.91	
Coyote	2	**Mid-Coyote - Full** (Montague Expwy to I-280)	**San Jose**	2,200	$ 150,200	2.8	0.25	$ 8,400	**59**	$ 500,000	$ 500,000	0.31	
Coyote	2	**Upper Penitencia- Corps Proj.** (Coyote Ck. to Dorel Dr.) **HAZUS Analysis on FEMA floodplain**	**San Jose**	7,134	$ 442,700	20	0.5	$ 11,100	**58**	$ 139,000	$ 42,000	1.46	
Coyote	2	**Upper Penitencia - Corps Proj.** (Coyote Ck. to Dorel Dr.) **Corps Economics on Corps floodplain**	**San Jose**			20	0.5	$ -	**58**	$ 139,000	$ 42,000	0.00	

Table 1: Summary of Technical Findings on Candidate Capital Projects

All Calculations Were Made for Internal Screening/ Comparison Purposes Only

All Costs Shown in $1,000s

Watershed	Category	Creek (Reach)	City	Appx. No. Parcels in 1% floodplain	1% Damages (HAZUS, unless otherwise noted) Ref (1)	Flood Return Period (yrs) Ref (2) WWMM	C for Avg Annual Dmgs Ref (3)	Avg Annual Damages Ref (4)	CIP Score Ref (5)	Total Project Cost (Est.)	Estd SCW Project Cost (post CSC)	Prelim B:C Ratio Ref (6)	Notes
Coyote	2	**Upper Upper Berryessa** (upstream 680) Corps-deleted **HAZUS Analysis on FEMA floodplain**	San Jose	1,600	$ 50,400	10	0.45	$ 1,800	53 As part of whole Upper Project	$ 29,000	$ 29,000	1.13	floodplain from FEMA DFIRM and SCVWD Shallow 1% flooding. Econ from Hazus-MH run, 2011
Coyote	2	**Upper Upper Berryessa** (upstream 680) Corps-deleted **Corps Economics on Corps floodplain**	San Jose	500	$ 15,600	10	0.45	$ 500	53 As part of whole Upper Project	$ 29,000	$ 29,000	0.31	econ is from 2006 Corps report
All	2	**SF Shoreline** (All tidal flood areas)	Multiple	4,271	$ 850,000	10	0.45	$ 29,500	32 Likely to be increased in 2012	?	$ 5,000		Construction cost unknown
Guadalupe	3	**Canoas Creek** (Nightengale to Cottle)	San Jose	~~9700~~ Zero with new 2009 hydrology	$ -	95	1	$ -	61 possible reduction to ~15	n/a	$ 72,000		Corps 2009 Hydrology, adopted by SCVWD significantly reduces 1% overbanking; Upper Guad proj. will further reduce to v. small no. parcels
Coyote	3	**South Babb Creek**	San Jose	1,545				$ -	55 As part of combined study				Babb Ck. Is in CIP as part of (Unfunded) combined rehabilitation with other east side creeks
Guadalupe	3	**Alamitos Creek** (Upstream Lake Almaden)	San Jose	1,100	$ 51,000	95	1	$ 1,000	51	$ 62,000	$ 62,000	0.29	
Guadalupe	3	**Los Gatos Creek**	Campbell, Los Gatos, San Jose					$ -	12				Not analyzed
Coyote	3	**Calera Creek** (u/s Milpitas H.S. to u/s Hwy 680)	Milpitas	1,200	$ 45,000	95	1	$ 900	44 (unpublished)	$ 26,000	$ 26,000	0.63	
West Valley	3	**San Tomas Aquino** (SPRR to Williams Rd.)	Santa Clara, San Jose	4,400	$ 224,000	25	0.6	$ 5,600		$ 500,000	$ 500,000	0.20	Cost est. not based on analysis - placeholder for "LARGE"
West Valley	3	**Smith Creek**	Campbell, Los Gatos					$ -					Not analyzed
Pajaro	3	**Alamias Creek**	County					$ -					Not analyzed
Pajaro	3	**Jones Creek**	County	210				$ -					Not analyzed
Pajaro	3	**West Branch Llagas Creek**	Gilroy	174				$ -					Not analyzed
L. Peninsula	3	**Loyola Creek**	Los Altos	-				$ -					Not analyzed
L. Peninsula	3	**Stevens Creek**	Mountain View	200				$ -					Not analyzed
L. Peninsula	3	**Hale Creek**	Mountain View	630				$ -	**Assessed as part of Upper Permanente Creek**				part of CSC Permanente Proj.
L. Peninsula	3	**Palo Alto Flood Basin**	Palo Alto	1				$ -					Not analyzed
Guadalupe	3	**Calero**	San Jose	47				$ -					Not analyzed
Guadalupe	3	**Randol Creek**	San Jose					$ -					Not analyzed
Guadalupe	3	**Ross Creek**	San Jose					$ -					flood problem is near confl. w/Upper Guad & will be addressed w/that proj. by 2016
Guadalupe	3	**Santa Teresa Creek**	San Jose	30				$ -					Not analyzed

Table 1: Summary of Technical Findings on Candidate Capital Projects

All Calculations Were Made for Internal Screening/ Comparison Purposes Only

All Costs Shown in $1,000s

Watershed	Category	Creek (Reach)	City	Appx. No. Parcels in 1% floodplain	1% Damages (HAZUS, unless otherwise noted) Ref (1)	Flood Return Period (yrs) Ref (2) WWMM	C for Avg Annual Dmgs Ref (3)	Avg Annual Damages Ref (4)	CIP Score Ref (5)	Total Project Cost (Est.)	Estd SCW Project Cost (post CSC)	Prelim B:C Ratio Ref (6)	Notes
Coyote	3	**Quimby Creek**	**San Jose**	3,451				$ -					Proposed as part of multi-creek study for SCW: Ruby, Norwood, Quimby, Fowler - tribs to Lower Silver
Coyote	3	**Sierra Creek**	**San Jose**	2,016				$ -					Proposed as part of multi-creek study for SCW: Crosby, Sierra - tribs to Upper Berryessa
Coyote	3	**Fisher Creek**	**San Jose, County**	166				$ -					Not analyzed
West Valley	3	**Saratoga Creek**	**Saratoga**	55				$ -					Not analyzed
West Valley	3	**Vasona Creek**	**Saratoga**					$ -					Not analyzed
West Valley	3	**Wildcat Creek**	**Saratoga, San Jose**	184				$ -					Not analyzed

References

1. 1% damage source: FEMA Hazus-MH model using published DFIRM maps and SCVWD shallow flooding, which is based on 1980s FEMA unpublished studies for Santa Clara County (unpublished because FEMA doesn't track < 1' depth flooding). See Appendix D. Some creeks report economic damages from Corps studies, as noted
2. WWMM: Waterways Management Model, mid 1980s-1990's asset management model
3. SCVWD Waterways Planning Study, 1983 (TC4255383W381983v.1c.2). See Appdx. G, Figure 7D, pg 44 "Correction Factor For Estimating Average Annual Damages"
4. SCVWD Waterways Planning Study, 1983 (TC4255383W381983v.1c.2). See Appdx. G, Equation, pg. 42,
5. SCVWD FY2012-16 CIP, or re-calculated as noted
6. B:C = Avg Annual Damages / Pmt(construction cost discounted at 5% for 50 years)

Appendix A

Summary of Findings and Status for Candidate Creek Reaches

(as of October 31, 2011)

Brief description of the findings and decisions regarding whether to proceed with specific creek reaches as capital projects in the Safe, Clean Water program

	= Candidate for funding as of 10/31/11	
Included in SCW Program?	**Creek (Reach)**	**Results of Safe, Clean Water Research and Analyses**
Category 1 - Clean Safe Creeks 2000 projects that require additional funding to complete beyond the CSC allocation		
	Upper Llagas Creek (Morgan Hill, Buena Vista Ave. to Wright Ave. and W. Little Llagas)	Continuation and supplemental funding for a Corps/ SCVWD partnership outlined in the Clean, Safe Creeks 2000 program. The Corps has not been fully funding its share of the program; funds from the Safe, Clean Water program will be used to move the project forward. However, there will not be sufficient funds to complete the project without the Corps' continued support.
	Upper Berryessa (Calaveras Blvd. to 680) **HAZUS Analysis on FEMA/ CSC Floodplain**	Continuation and final funding for a Corps/ SCVWD partnership outlined in the Clean, Safe Creeks 2000 program. **(Subsequent to this memo, determined that CSC funding is sufficient, however <u>Upper Guadalupe</u> project found to require add'l funding)**
Category 2 - Ongoing capital projects that would benefit from SCW funding to accelerate results		
	San Francisquito Creek (SF Bay to Searsville Dam- combined upper and lower projects, both sides of the creek (2 Counties))	This will be a multi-agency project with the 5-member JPA and the Corps. A project to protect over 3,000 parcels is in the planning stages, much of the planning was funded through the Clean, Safe Creek initiative. The Safe, Clean Water program will fund the District's assumed share of the ultimate $128 + million project. The SCVWD engineering team ran a Hazus analysis, but the Corps published in June 2011 a more detailed economic analysis, capturing benefits on both sides of the creek (San Mateo Co. and Santa Clara Co.) - the Corps numbers are used.
	Upper Penitencia (Coyote Ck. to Dorel Dr.) **HAZUS Analysis on FEMA floodplain**	This is a continuation of the local commitment for a Corps/SCVWD partnership on a project which has been under study since the early 1990's. The project provides flood protection as part of a tri-party agreement with the City of San Jose and the County of Santa Clara to also preserve parks, trails and open spaces along the linear path of the 4+ mile creek reach. Funding from the Safe, Clean Water program will support the local share; the project will continue to depend on Federal Funding to move to completion. The Corps has initiated an economnic analysis, however numbers were not final as of October 2011. Economic numbers reported here are from a Hazus-MH run in 2011 by SCVWD staff.
(Subsequently Removed from Plan)	**Upper Berryessa** (upstream 680) Corps-deleted **HAZUS Analysis on FEMA floodplain**	This is the reach upstream of Hwy 680, which was removed from the Corps / SCVWD project area. It was part of the original Clean, Safe Creeks program. Liang Lee suggested that the District should fund this to completion on its own. A proposal was developed for this capital project, provided in Appendix J SCVWD staff calculated benefits based on the adjacent FEMA and Shallow floodplains in 2011, using FEMA's HAZUS; the Corps also calcuated benefits in its 2006 report, using a smaller floodplain. Corps benefits are approximately 1/3 of the benefits calculated using the FEMA/ shallow floodplain and HAZUS. See Table 1 for results. **Removed from consideration in Safe, Clean Water program by Liang and Melanie, based on B:C**
	SF Shoreline (All tidal flood areas)	The SCW program would fund a portion of the SF Shoreline study, a multiple agency partnered study. Additional costs for design and construction will be identified during the planning phase.

Included in SCW Program?	Creek (Reach)	Results of Safe, Clean Water Research and Analyses
Category 3 - New Capital projects		
Study Only	**Alamitos Creek** (Upstream Lake Almaden)	A project was completed in 1981 to provide 1% flood protection to then-current standards. Five years later, FEMA published new standards for flood protection, and the project did not meet them. Subsequently, the adjacent neighborhood was mapped into a FEMA regulatory floodplain. The project is now 30 years old, and a rehabilitation to meet current FEMA flood protection standards was proposed, provided in Appendix J **Instead of a capital project, an engineering study is proposed for the Safe, Clean Water program. One intended outcome to re-map the residual (behind-levee) regulatory floodplain, possibly reducing the number of homes in the regulatory floodplain by several hundred. The study would follow to-be-published FEMA guidelines regarding mapping behind levees.**
Study Only	**Calera Creek** (u/s Milpitas H.S. to u/s Hwy 680)	A project was completed in 1983 to provide 1% flood protection to then-current standards. Three years later, FEMA published new standards for flood protection, and the project did not meet them. Subsequently, the adjacent neighborhood was mapped into a FEMA regulatory floodplain. The project is now nearly 30 years old, and a rehabilitation project to meet current FEMA flood protection standards was proposed, provided in Appendix J. **Instead of a capital project, an engineering study is proposed for the Safe, Clean Water program. One intended outcome to re-map the residual (behind-levee) regulatory floodplain, possibly reducing the number of homes in the regulatory floodplain by several hundred. The study would follow to-be-published FEMA guidelines regarding mapping behind levees.**
Study Only	**Quimby Creek**	With over 3,000 parcels potentially in the 1% floodplain (shallow flooding), this creek was proposed for further study. There is insufficient information available to develop a potential project plan and related capital cost estimate; no B:C was calculated. However, combined with Ruby, Norwood and Fowler Creeks (Tributaries to Lower Silver/ Thompson), a hydrologic and hydraulic study has been proposed to further understand the potential \$176 million in 1% damages, or \$4.7 million in avg. annual damages. **Recommended to fund a technical study in Safe, Clean Water program, combined with Ruby, Norwood and Fowler Creeks.**
	Sierra Creek	With over 2,000 parcels potentially in the 1% floodplain (shallow flooding), this creek was proposed for further study. There is insufficient information available to develop a potential project plan and related capital cost estimate; no B:C was calculated. However, combined with Crosley Creek (both are tributaries to Upper Berryessa), a hydrologic and hydraulic study was proposed to further understand the potential \$77.8 million in 1% damages, or \$3.2 million in avg. annual damages. Rather than initiate a new, separate study, this creek reach was proposed to be studied in combination with the Upper Berryessa project, Upstream of Highway 680. **Removed from consideration in Safe, Clean Water program.**
	(Upper) Permanente (Mt. View, U/S El Camino)	A plan was developed for this reach, upstream of El Camino Avenue, including Hale Creek and the diversion to Stevens Creek as part of the Clean, Safe Creeks- funded planning study. The CSC program will fund construction of the lower portion, however, the low B:C ratio and lack of community support diminished the priority for this upstream reach. A proposal was developed for this capital project, provided in Appendix J **Removed from consideration in Safe, Clean Water program**

Included in SCW Program?	Creek (Reach)	Results of Safe, Clean Water Research and Analyses
	Mid-Coyote - partial (Reaches 6 – 8b of CSC study–Highway 880 to Berryessa Rd.)	This reach was studied as part of the Clean, Safe Creeks 2000 program and a plan was developed to provide 1% flood protection for up to 130 parcels. A proposal was developed for this capital project, provided in Appendix J. However, this reach was removed from consideration for the Safe Clean Water program, per management direction, pending the re-design of the Anderson Dam and related outlet works, as there may be flood protection benefits from the dam retrofit. **Removed from consideration in Safe, Clean Water program**
	Mid-Coyote - Full (Montague Expwy to I-280)	This reach was studied as part of the Clean, Safe Creeks 2000 program and a plan was developed to provide 1% flood protection for up to 2,200 parcels. However, first estimates put that plan at a cost of close to a half-billion dollars. For this reason, it was not considered for funding in the Safe, Clean Water program. **Not Considered for Safe, Clean Water program**
	South Babb Creek	This floodplain, with 1,500 parcels, has been considered for inclusion in the CIP as a rehabilitation project prior to development of the Safe, Clean Water program. **Not Considered for Safe, Clean Water program**
	San Tomas Aquino (SPRR to Williams Rd.)	Approximately 5,000 parcels are subject to flooding of roughly 1 foot depth in this area (including both FEMA and shallow flooding as mapped by the district). While economic damages for this floodplain are quite high, the impediments to improving this reach to convey the 1% flow indicate it is not feasible to fund a capital project nor to expect one to be feasible during the 15-year window of the Safe, Clean Water program. A memorandum documenting these findings is included in **Appendix I.** **Not Considered for Safe, Clean Water program**
	Canoas Creek (Nightengale to Cottle)	Once thought to inundate over 9,000 parcels during the 1% event; however 2009 hydrology developed and published by the Corps and accepted by the District as Best Available Data indicates there would be little or no overbanking during the 1% event. The exception is a relatively small area near the confluence with the Upper Guadalupe River, which will be mostly or fully addressed during the construction of that Corps/SCVWD Upper Guad project. A memorandum was developed to describe a new CIP score based on the updated finding. The memo and score sheet are located in Appendix H. The updated Corps 2009 hydrology is provided in Appendix E. **Not Considered for Safe, Clean Water program**
	Los Gatos Creek	Relatively few parcels in the 1% floodplain. **Not Considered for Safe, Clean Water program**
	Smith Creek	Relatively few parcels in the 1% floodplain. **Not Considered for Safe, Clean Water program**
	Alamias Creek	Relatively few parcels in the 1% floodplain. **Not Considered for Safe, Clean Water program**
	Jones Creek	Relatively few parcels in the 1% floodplain. **Not Considered for Safe, Clean Water program**
	West Branch Llagas Creek	Relatively few parcels in the 1% floodplain. **Not Considered for Safe, Clean Water program**
	Loyola Creek	Relatively few parcels in the 1% floodplain. **Not Considered for Safe, Clean Water program**
	Stevens Creek	Relatively few parcels in the 1% floodplain. **Not Considered for Safe, Clean Water program**
	Hale Creek	Included in the Upper Permanente plan and assessment **Not Considered for Safe, Clean Water program**
	Palo Alto Flood Basin	Relatively few parcels in the 1% floodplain. **Not Considered for Safe, Clean Water program**

Included in SCW Program?	Creek (Reach)	Results of Safe, Clean Water Research and Analyses
	Calero	Relatively few parcels in the 1% floodplain. **Not Considered for Safe, Clean Water program**
	Randol Creek	Relatively few parcels in the 1% floodplain. **Not Considered for Safe, Clean Water program**
	Ross Creek	Relatively few parcels in the 1% floodplain. **Not Considered for Safe, Clean Water program**
	Santa Teresa Creek	Relatively few parcels in the 1% floodplain. **Not Considered for Safe, Clean Water program**
	Fisher Creek	Relatively few parcels in the 1% floodplain. **Not Considered for Safe, Clean Water program**
	Saratoga Creek	Relatively few parcels in the 1% floodplain. **Not Considered for Safe, Clean Water program**
	Vasona Creek	Relatively few parcels in the 1% floodplain. **Not Considered for Safe, Clean Water program**
	Wildcat Creek	Relatively few parcels in the 1% floodplain. **Not Considered for Safe, Clean Water program**

Appendix B

Flood Protection and Stream Stewardship Master Plan 2010, Chapter 4 "Needs and Opportunities"

Full report available at:

www.valleywater.org/Services/FloodProtectionMasterPlan.aspx

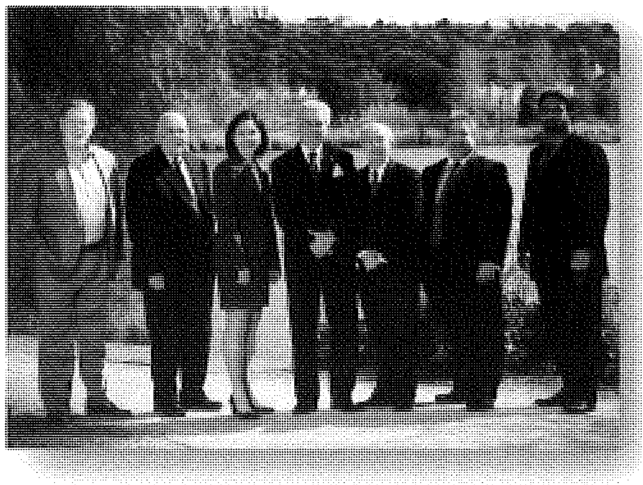
FLOOD PROTECTION AND STREAM STEWARDSHIP MASTER PLAN

DRAFT CHAPTER 4

NEEDS AND OPPORTUNITIES

OCTOBER 2010

The mission of the district is a healthy, safe and enhanced quality of living in Santa Clara County through watershed stewardship and comprehensive management of water resources in a practical, cost-effective and environmentally-sensitive manner for current and future generations.



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4. NEEDS AND OPPORTUNITIES

INTRODUCTION

The purpose of this chapter is to identify and describe the *needs and opportunities* relative to the Flood Protection and Stream Stewardship (FPSS) Master Plan goals and objectives described in Chapter 2. An assessment of the existing FPSS program projected over the 25-year planning horizon provides the basis for identifying *needs and opportunities*. This step in the planning process is, in effect, the "gap" analysis to identify those areas where the district's FPSS program is at some risk of not meeting the master plan goals and objectives over the 25-year planning horizon. Where needs were identified, opportunities to meet those needs were also identified and are the basis for developing projects for the potential program. Figure 4.1 shows the Master Plan planning process.

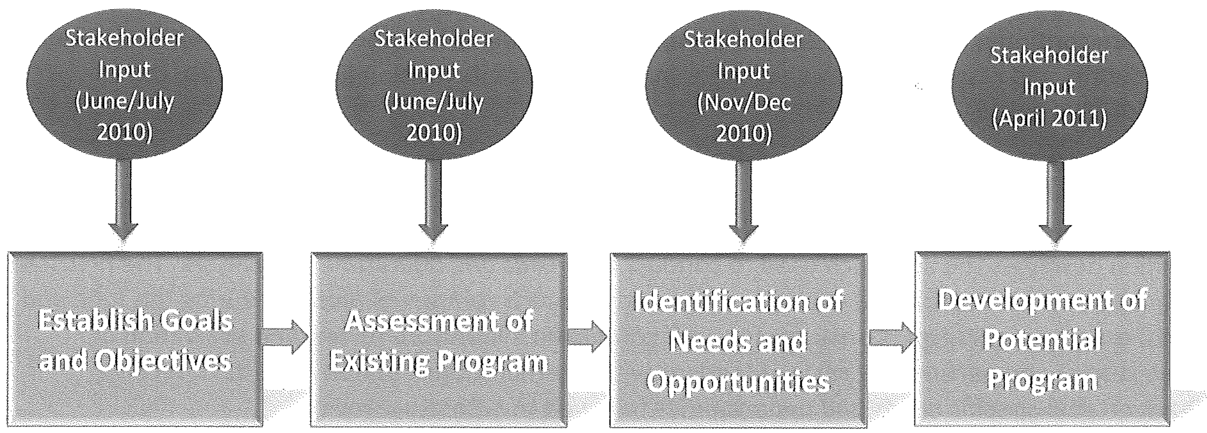


Figure 4.1 Flood Protection and Stream Stewardship Master Plan Process

This chapter provides a brief overview in Section 4.1 of how flood protection and stream stewardship planning has progressed at the district. Section 4.2 summarizes the approach used to identify the *needs and opportunities* presented in this chapter. Sections 4.3 through 4.7 describe goal-specific *needs and opportunities* to meet community and stakeholder expectations and Board policy.

This chapter format follows the outline presented in Chapter 3: Flood Protection and Stream Stewardship Program. The *needs and opportunities* are described for the five master plan goals, as follows:

Goal 1: Natural flood protection for residents, businesses, and visitors.
Goal 2: Reduced potential for flood damages.
Goal 3: Healthy creek and bay ecosystems.
Goal 4: Clean, safe water in our creeks and bays.
Goal 5: Improved quality of life in Santa Clara County through trails, open space and water resources management.

4.1 FLOOD PROTECTION AND STREAM STEWARDSHIP PLANNING OVERVIEW

The district developed the existing FPSS program in the late 1990s through extensive community input to assess the needs, priorities and expectations of the Santa Clara County community. The goal of that effort was to build a plan that both met the Board of Directors' (board) policy and received community support. More than two-thirds of the county voters approved the Clean, Safe Creeks and Natural Flood Protection special parcel tax (Clean, Safe Creeks special tax) in November 2000.

Since its inception, the FPSS program has evolved in response to new challenges. These challenges have been funding shortfalls, evolving regulatory requirements, and community expectations. In 2002, the district modified its official mission statement, adding watershed stewardship to flood protection and water supply functions as key components of its charter. The district defines stewardship as "To entrust the careful and responsible management of the environment and natural resources to one's care for the benefit of the greater community."

The program continues to evolve in 2011. Through this planning effort, the district intends to position itself to identify and respond to new challenges in fulfillment of its mission and, therefore, the communities' interests.

4.2 APPROACH

This section describes the approach used to conduct the *needs and opportunities* analysis. The first step in this analysis was to review and evaluate the public outreach comments received during the June and July 2010 outreach meetings. Concurrently, staff conducted a literature review and evaluation of previous studies and pertinent reports. Meetings with internal subject matter experts to receive feedback on goal-specific *needs and opportunities* followed the literature review.

4.2.1 Public Outreach and Staff Engagement

This section summarizes the public and targeted group outreach comments received in June and July 2010 stakeholder engagement meetings.

The district held two public meetings on June 9 and 14, 2010, to receive comments on the planning process. Prior to the meetings, the district sent notices to 282 individuals actively involved in previous district capital projects. In addition, the district advertised public notices in newspapers throughout the county. The district's webpage also featured a public meeting announcement two weeks prior to the meetings.

In addition to the broad public outreach efforts described above, the district made presentations to and received feedback and insight on key issues from these groups and committees:

- Board Joint Flood Control and Watershed Advisory Committee meeting on June 2, 2010
- Board Environmental Advisory Committee Meeting on June 7, 2010
- Bay Area Flood Protection Agencies Association Meeting on June 17, 2010
- Morgan Hill Chamber of Commerce Environmental Affairs Council on July 8, 2010
- District's Water Resource Planning Stakeholder Review Committee on July 19, 2010
- San Martin Planning Advisory Committee on August 4, 2010

4.2.1.1 Public Comment Overview

The district received comments on the draft Master Plan Chapters 1, 2 and 3 and on information presented during the June and July 2010 outreach efforts. The district prepared responses to those comments and posted them on the website. Some of the recurring themes that appeared in those comments include:

- Provide more opportunities for stakeholder input and feedback.
- Existing program activities are important.
- Evaluate balance among program goals.
- Strive for geographic balance of benefits

PUBLIC COMMENT THEMES

- *Provide more opportunities for input*
- *Existing program activities are important*
- *Strive for balance among program goals*
- *Strive for geographic balance of benefits*

4.2.1.2 Staff Engagement

This section summarizes efforts by the master plan project team to seek input from district subject matter expert staff on *needs and opportunities* to achieve the five goals and objectives of the master plan. Staff that participated in the meetings included engineers, biologists, project managers, environmental planners, public information and education specialists, unit managers, executive level managers, and field operations staff. This broad representation of district staff provided insights on key issues and input for program improvements. Input from district staff complemented the results of the literature review and public outreach efforts to help refine the *needs and opportunities* assessments.

4.2.1.3 Review and Evaluation of Previous plans and Studies

Staff reviewed and evaluated previous planning reports and watershed related studies to identify *needs and opportunities*. These documents include watershed stewardship plans, watershed management and action plans, comprehensive water resource management plans, asset management plans, quality environmental management systems work instructions and procedures, maintenance guidelines, and other district documents. Appendix ## provides a complete list of literature reviewed.

4.3 NATURAL FLOOD PROTECTION NEEDS AND OPPORTUNITIES

On August 8, 2001, Governor Gray Davis signed Senate Bill 449, amending the District Act. Among other changes, the amendment allows the district to "enhance, protect, and restore streams, riparian corridors, and natural resources..." This amendment created unprecedented opportunities to integrate stream and riparian restoration into the district's capital construction projects and its maintenance operations.[1]

Natural flood protection is a multi-objective approach to providing environmental quality, community benefit, and protection from creek flooding in a cost effective manner. The district does this through integrated planning and management that considers the physical, hydrologic and ecologic functions and processes of streams within the community setting. The district evaluates alternatives for flood protection that achieve natural stream functions, to the extent feasible and practicable.

Similarly, the district conducts stream maintenance operations to preserve flood conveyance capacity using best management practices that minimize impacts to the environment. This ensures that district facilities continue to provide the level of flood protection for which they were constructed. It also ensures that the district protects the public's investment in flood management infrastructure by not allowing it to fall into disrepair.

This section summarizes the *needs and opportunities* related to achieving the goal of natural flood protection for residents, businesses, and visitors.

4.3.1 Natural Flood Protection Objectives and Strategies

The board has adopted two objectives in support of achieving the goal of natural flood protection for residents, businesses, and visitors. The first objective is to balance environmental quality and protection from flooding in a cost effective manner. The district has provided this protection from flooding primarily through flood protection capital improvements. These capital improvements include projects that protect existing watershed infrastructure or restore it to its intended level of protection and projects that provide an increased level of protection from flooding. A key performance indicator for flood protection capital improvements is the number of parcels protected from 1-percent flooding. A 1-percent flood is a flood that has a 1-percent chance of occurring in any given year. It is also referred to as a 100-year flood, but it should not be interpreted to mean that a flood of this magnitude only occurs every 100 years.

The second objective is to preserve flood conveyance capacity. The district administers a total asset management program and performs stream maintenance activities to meet this objective. Key performance indicators for preserving flood conveyance capacity include average annual sediment removal quantities, number of facility condition assessments performed annually, miles of levees inspected and maintained, and acres of vegetation control for restoring stream capacity.

[1] Santa Clara Basin Watershed Action Plan

4.3.2 Natural Flood Protection Specific Needs and Opportunities

For the goal of natural flood protection, *needs and opportunities* were developed by identifying areas that will remain subject to flooding after 2016 when the Clean, Safe Creeks projects are expected to be completed. For this analysis, the 1-percent flood maps include shallow flooding areas of less than one foot of depth and Federal Emergency Management Agency (FEMA) flooding areas greater than one foot. The areas that will continue to be at risk from flooding after 2016 were identified as *needs*. For each of these areas, an approximate number of parcels at risk from flooding has been calculated using Geographic Information Systems (GIS) computer software. Flood protection projects that would eliminate or reduce the threat of flooding from these areas were identified as *opportunities* to provide natural flood protection. Flood management planning and operations tools such as Quality and Environmental Management Systems policies, procedures, and work instructions, GIS, and the district's Waterways Management Model assisted this analysis. Figure 4.2 shows that areas that will continue to be at risk from 1-percent flooding after 2016.

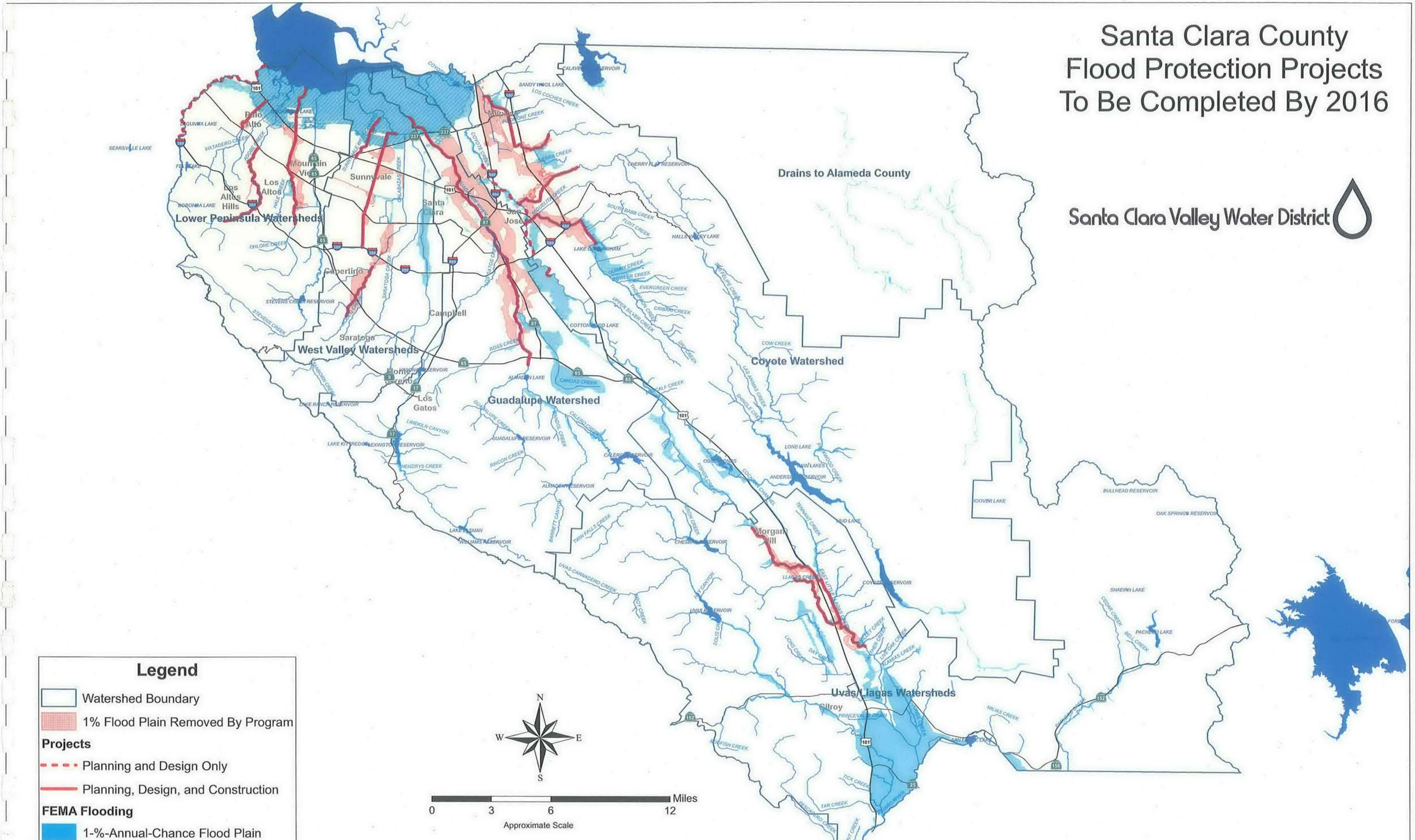
Additionally, climate change impacts are expected to result in sea level rise that will expand the areas that are at risk from tidal flooding. Sea level rise may also affect the design flood conveyance of flood protection projects constructed near the bay. The San Francisco Bay Conservation and Development Commission (BCDC) has produced inundation maps which illustrate sea level rise scenarios for a 16-inch rise and a 55-inch rise. The BCDC scenarios (not predictions) are based on a sea level rise of 16 inches in South San Francisco Bay by 2050 and of 55 inches by 2100. These scenarios are based on recommendations on sea level rise by an Independent Science Board (ISB). The ISB was employed by the Delta Vision Blue Ribbon Task Force to conduct a literature review and to provide recommendations on sea level rise. Based on their findings, the ISB recommended adopting an estimated rise in sea level of 55 inches (140 cm) by 2100 and recommended adopting a sea level rise estimate for 2050 as well.

For the purposes of this analysis, the number of parcels calculated to be at risk from 1-percent flooding is based on the shallow and FEMA flood, not the inundation maps for the sea level rise scenarios. However, under the board's policies, the district is required to apply and understanding of climate change and climate change impacts to all flood protection projects and asset management and infrastructure plans. Projects and programs that are included in the future planning horizon will consider climate change impacts. Figure 4.3 shows the areas vulnerable to sea level rise in the south bay under the two scenarios.

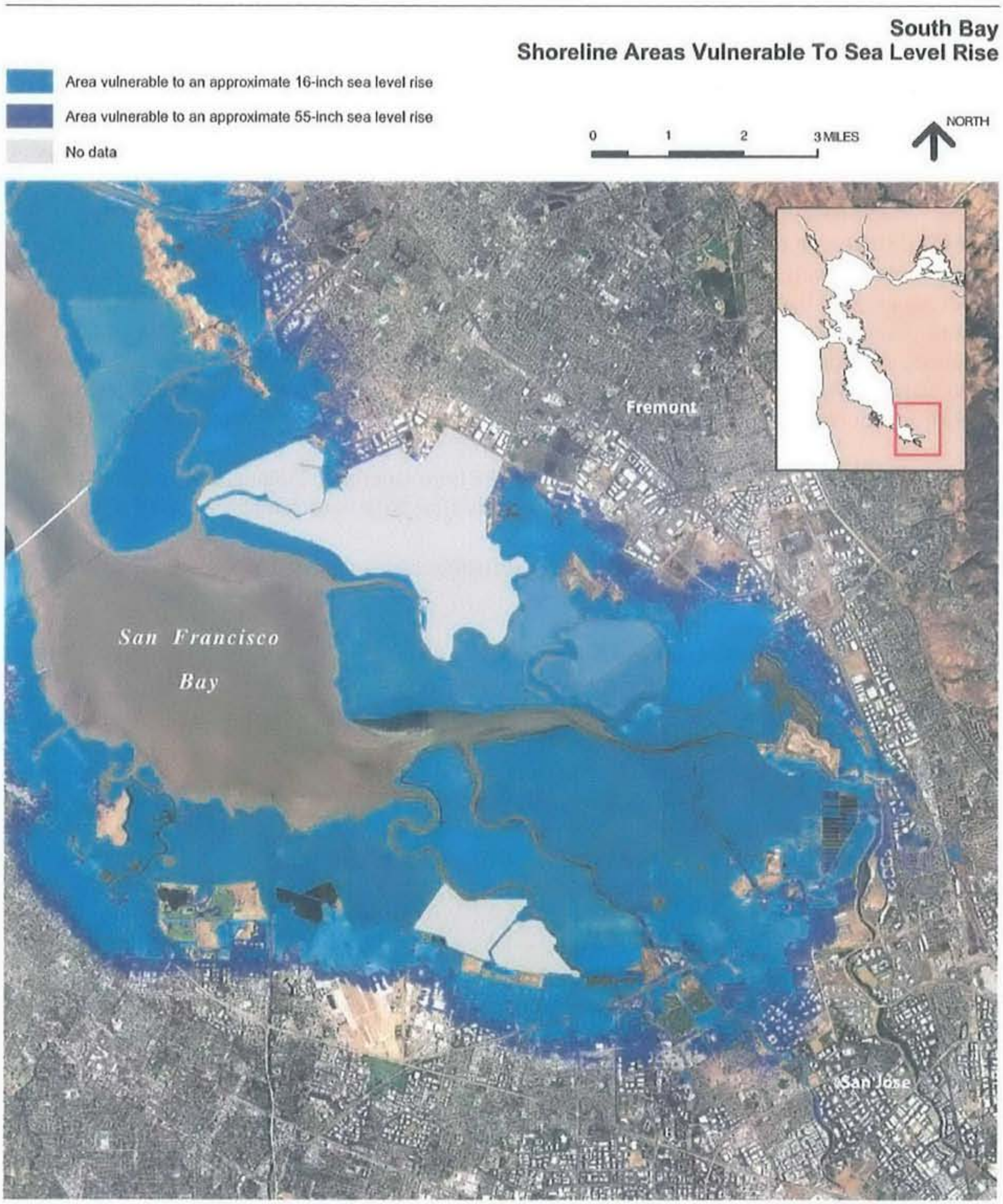
Another factor that could generate a future need is aging infrastructure. Some district facilities were constructed in the late 1950s and early 1960s and may require rehabilitation in the future planning horizon. In the instances where it is no longer cost-effective to preserve flood conveyance with maintenance only, a *need* was identified. Some of these *needs* also represent *opportunities* to provide 1-percent flood protection, particularly in urban areas where the district facilities were constructed to provide a lower level of flood protection.

The areas that will continue to be at risk from 1-percent flooding in the next planning horizon have been identified for each of the major watersheds.

Santa Clara County Flood Protection Projects To Be Completed By 2016



GIS themes are for illustration and general analysis purposes only and are not accurate to surveying or engineering standards. Information is not guaranteed to be accurate, current, or complete and use of this information is your responsibility.



NOTE: Inundation data from Knowles, 2008. Additional salt pond elevation data by Siegel and Bachand, 2002. Inundation data does not account for existing levees or other shoreline protection. Aerial imagery is NAIP 2005 data.

Figure 4.3 San Francisco Bay Conservation and Dervelopment Commission Sea Level Rise Scenarios

4.3.2.1 Balance environmental quality and protection from flooding in a cost effective manner.

This objective primarily focuses on the capital program for flood protection improvements.

The FY 2011 capital improvement program for flood protection includes projects that are part of the "baseline" flood protection program and projects added through the Clean, Safe Creeks plan and funding. These flood protection projects are described in more detail in Chapter 3 of the Master Plan. While the district is on track to complete all of these flood protection projects by 2016, completion of some of these projects relies on the district receiving congressional appropriations for construction. As a result, six projects that are partially funded by state and federal programs may be delayed after 2016. These six projects are Upper Guadalupe River and San Francisquito, Lower Silver, Berryessa, Upper Penitencia, and Upper Llagas creeks. By 2016, the district's current natural flood protection program, combined with all other flood protection projects of previous years, will protect approximately 140,000 parcels from flooding. Approximately 55,000 parcels will continue to be at risk from 1-percent flooding.

The following sections identify all creeks that are at risk from 1-percent flooding, creeks that may be affected by sea level rise, and the main flooding sources after 2016 in each major watershed.

4.3.2.1.1 Natural flood protection needs and opportunities associated with the Lower Peninsula Watershed

The Lower Peninsula Watershed includes the Town of Los Altos Hills and the cities of Palo Alto, Los Altos, Mountain View, and portions of Cupertino. The watershed encompasses a 98-square-mile area whose many small-creek watersheds feed the tidal wetlands along the San Francisco Bay's southwest shoreline. Major streams are San Francisquito Creek, Matadero Creek, Barron Creek, Adobe Creek, Stevens Creek, and Permanente Creek. Other water features are Stevens Creek Reservoir and the Palo Alto Flood Basin, which acts as a hydraulic control for Matadero, Barron, and Adobe Creeks.

MAIN FLOODING SOURCES AFTER 2016

- *San Francisquito Creek*
- *Stevens Creek*
- *Hale Creek*
- *Loyola Creek*
- *Palo Alto Flood Basin*
- *Bay front tidal flooding*

Since 1982, the district has completed flood protection projects on Adobe, Barron, Matadero, and Stevens creeks. Additionally, by 2016, the district is expected to complete construction projects on Permanente Creek and a portion of Hale Creek and a planning and design project on San Francisquito Creek. By 2016, approximately 10,000 parcels will be protected from flooding.

The areas that will remain vulnerable to 1-percent flooding after 2016 will be along Stevens Creek between Highway 85 and Stevens Creek Dam; Hale Creek upstream of Rosita Avenue; Loyola Creek between Foothill Expressway and Highway 280; the Palo Alto Flood Basin; San Francisquito Creek upstream of Highway 101; and near the bay shoreline. Sea level rise could potentially reduce the flood conveyance capacity of previously constructed flood protection projects near the bay. These projects

include Adobe Creek, Barron Creek, Matadero Creek, the Palo Alto Flood Basin, Permanente Creek, San Francisquito Creek, and Stevens Creek.

The main areas of concern in the current floodplain are those areas flooded by San Francisquito Creek and the areas subject to tidal flooding. Approximately 5,245 parcels are at risk from flooding from these two flood threats including 1,985 parcels subject to both freshwater and tidal flooding. San Francisquito Creek alone has the potential to flood 3,260 parcels. Tidal flooding along the bay shoreline would inundate almost 3,230 parcels.

Figures 4.3 and 4.4 show the floodplains of San Francisquito Creek and of tidal flooding.

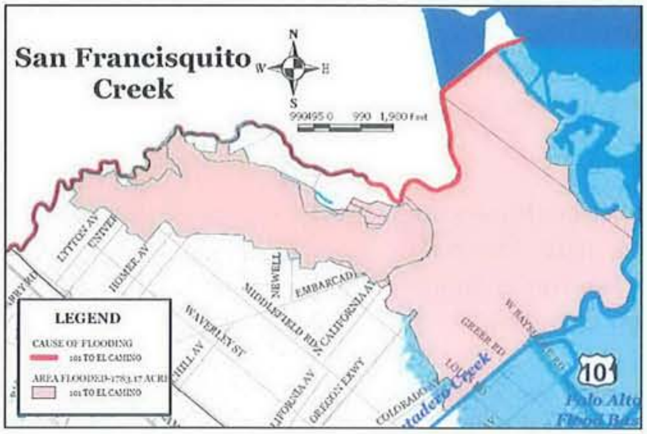


Figure 4.3 Floodplain for San Francisquito Creek

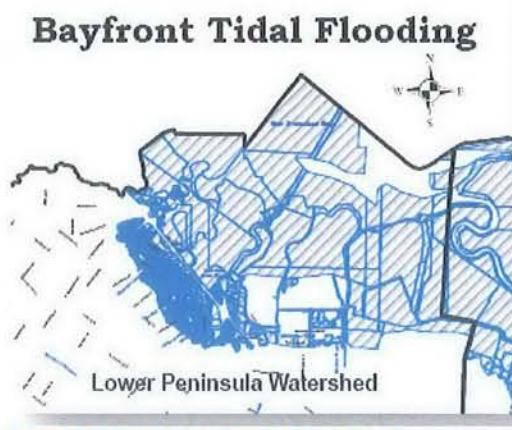


Figure 4.4 Floodplain for tidal flooding

Stevens Creek is also subject to flooding, but threatens only about 200 parcels. The district's approach to flood protection on Stevens Creek has been based on a property buy-out program of parcels located in the 1-percent floodplain. Nevertheless, Stevens Creek is of interest as a multi-objective project due to its high potential for watershed stewardship projects in connection with the Three Creeks Habitat Conservation Plan (Three Creeks HCP) and various trails and open space projects. The Three Creeks HCP is an effort to establish conservation measures and permit conditions to conduct water supply operations pursuant to the Endangered Species Act (ESA) and state water rights requirements.

MAIN FLOODING SOURCES AFTER 2016

- *San Tomas Aquino Creek*
- *Saratoga Creek*
- *Smith Creek*
- *Vasona Creek*
- *Wildcat Creek*
- *Bay front tidal flooding*

4.3.2.1.2 Natural flood protection needs associated with the West Valley Watersheds

The West Valley Watersheds include portions of the cities of Sunnyvale, Cupertino, Monte Sereno, San Jose, Santa Clara, Campbell, Saratoga and the Town of Los Gatos. The watershed is the County's smallest and encompasses an 85-square-mile area of multiple small-creek watersheds. Major streams and watercourses include Guadalupe Slough, Sunnyvale West Channel, Sunnyvale East Channel, Calabazas Creek, San Tomas Aquino Creek, and Saratoga Creek.

Since 1982, the district has completed flood protection projects on portions of Calabazas, San Tomas Aquino, and Saratoga creeks. By 2016, the district is expected to complete additional construction on Calabazas Creek and Sunnyvale East and West Channels. By 2016, approximately 7,900 parcels will be protected from flooding.

Figure 4.5 Floodplain for San Tomas Aquino Creek

The areas that will remain vulnerable to 1-percent flooding after 2016 will be along San Tomas Aquino Creek upstream and downstream of Williams Road as shown in Figure 4.5, Saratoga Creek upstream of Fourth Street, Smith Creek, Vasona Creek, Wildcat Creek, and near the bay shoreline. Sea level rise could potentially reduce the flood conveyance capacity of previously constructed flood protection projects near the bay. These include projects constructed on Calabazas Creek and San Tomas Aquino Creek.

Approximately 5,200 parcels will continue to be at risk from freshwater flooding and about 60 parcels from tidal flooding after 2016. The main areas of concern in this watershed are flooding from San Tomas Aquino Creek at Williams Road and tidal flooding near the bay shoreline.

4.3.2.1.3 Natural flood protection needs associated with the Guadalupe Watershed

MAIN FLOODING SOURCES AFTER 2016

- *Alamitos Creek*
- *Calero Creek*
- *Canoas Creek*
- *Los Gatos Creek*
- *Randol Creek*
- *Ross Creek*
- *Santa Teresa Creek*
- *Bay front tidal flooding*

The Guadalupe Watershed includes portions of the cities of Santa Clara, San Jose, Campbell, Monte Sereno, and the Town of Los Gatos. The major streams are Los Gatos Creek, Canoas Creek, Ross Creek, Guadalupe Creek, Alamitos Creek, and Guadalupe River. The watershed area measures 170 square miles and its two largest tributaries, Guadalupe River and Los Gatos Creek confluence in downtown San Jose. Lexington Reservoir, one of the area's best-known landmarks, is located along the western border of this watershed. Other reservoirs in the watershed are Almaden, Guadalupe, and Calero Reservoirs.

Since 1982, the district has completed flood protection projects on the Lower Guadalupe River, and the Downtown Guadalupe River and bridge modifications at various locations. By 2016, the district is expected to complete projects on Upper Guadalupe River and on portions of Canoas and Ross Creeks. By 2016, nearly 12,000 parcels will be protected from flooding in the Guadalupe Watershed.

The areas that will remain vulnerable to 1-percent flooding after 2016 will be along Alamitos, Calero, Canoas, Los Gatos, Randol, Ross and Santa Teresa creeks. Nearly 12,700 parcels will be at risk from freshwater flooding and approximately 760 parcels will be at risk from tidal flooding.

The main areas of concern are flooding from Alamitos and Canoas creeks and tidal flooding near the bay shoreline. As in the case of Stevens Creek in the Lower Peninsula Watershed, there may be opportunities to integrate elements of the Three Creeks HCP into flood protection solutions for Alamitos Creek. Approximately 1,045 parcels are at risk from 1-percent flooding from Alamitos Creek. Figure 4.6 shows the floodplain of Alamitos Creek. Approximately 10,000 parcels are at risk from 1-percent flooding on Canoas Creek. The majority of this flooding is shallow flooding (less than one foot). Figure 4.7 shows the floodplain for Canoas Creek.

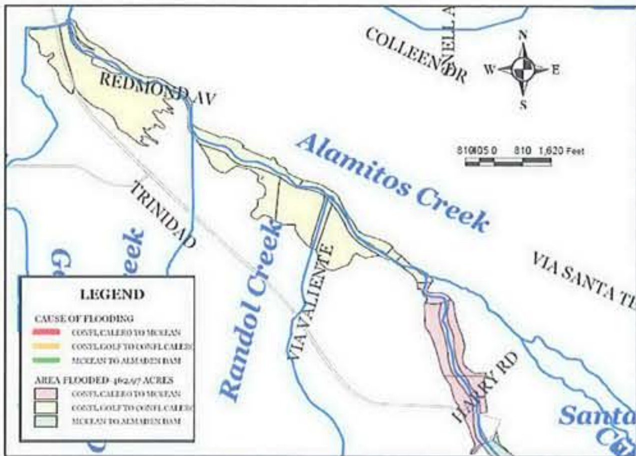


Figure 4.6 Floodplain for Alamitos Creek

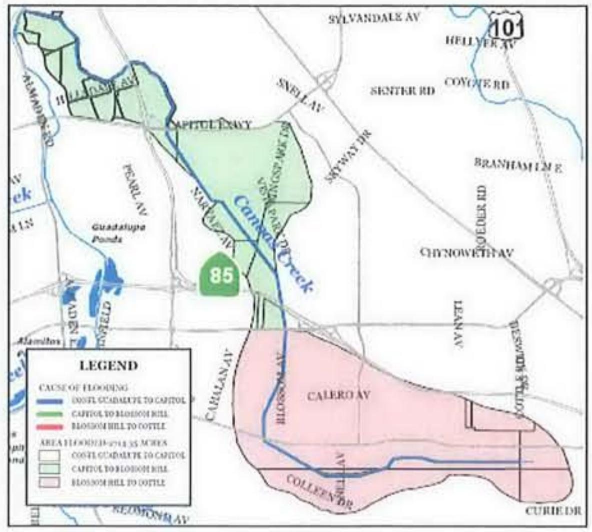


Figure 4.7 Floodplain for Canoas Creek

4.3.2.1.4 Natural flood protection needs associated with the Coyote Watershed

The Coyote Watershed is the north county's largest watershed, measuring 322 square miles. It extends from the urbanized valley floor upward to the vast natural areas of the Mt. Hamilton range. Coyote Creek, its main waterway, is the longest creek in the county (42.14 miles). The major tributaries to Coyote Creek are Lower Penitencia, Berryessa, Upper Penitencia, Lower Silver, Thompson, and Fisher Creeks. The geographic area includes the city of Milpitas and portions of the cities of San Jose and Morgan Hill.

MAIN FLOODING SOURCES AFTER 2016

- *Calera Creek*
- *Coyote Creek*
- *Fisher Creek*
- *Quimby Creek*
- *Sierra Creek*
- *South Babb Creek*
- *Upper Penitencia Creek*

Since 1982, the district has completed flood protection projects on Coyote Creek from Montague Expressway to the bay, Lower Penitencia Creek, and a portion of Lower Silver Creek. These projects protect approximately 2,470 parcels from flooding. By 2016, the district is expected to complete flood protection projects on another portion of Lower Silver Creek to protect approximately 5,400 parcels and at Lake Cunningham to protect an additional 3800 parcels. The district is pursuing federal and state funding to complete projects under way in FY 2011 for Berryessa and Upper Penitencia Creeks. The Berryessa Creek project will protect approximately 2,900 parcels from flooding. Upper Penitencia Creek is funded only for planning and partial design phases only. When constructed, it will protect more than 5,000 parcels.

The areas that will remain at risk from 1-percent flooding after 2016 are along Calera, Coyote, Crosley, Evergreen, Fisher, Fowler, Los Coches, Miguelita, North Babb, South Babb, Quimby, Sierra, Thompson, and Upper Silver creeks. Sea level rise could potentially reduce the flood conveyance capacity of previously constructed Coyote Creek near Dixon Landing Road and Lower Penitencia Creek.

The main areas of concern are flooding along Mid-Coyote Creek between Montague Expressway and Highway 280, Coyote Creek between Highway 101 and Metcalf Road, Fisher Creek, and Upper Penitencia Creek. Figures 4.8 to 4.10 show the areas at risk from 1-percent flooding from Coyote and Fisher creeks. These projects would provide flood protection to over 7,000 parcels. Additionally, these projects present opportunities to integrate elements of the Three Creeks HCP.

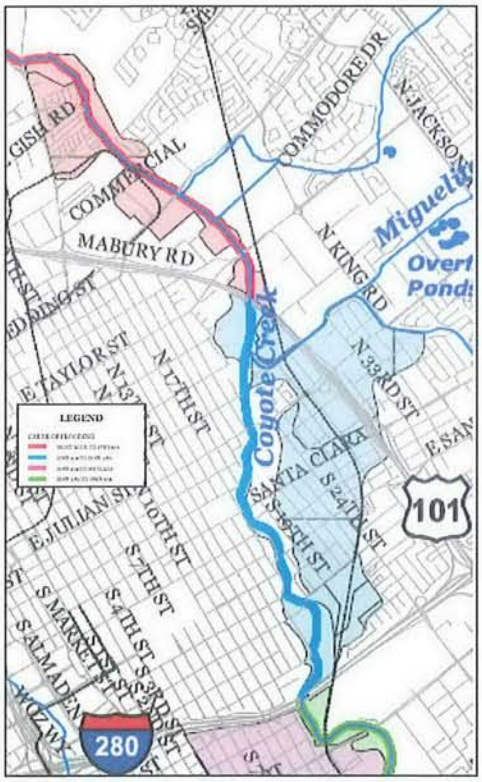


Figure 4.8 Floodplain for Coyote Cr. Mont. to 280

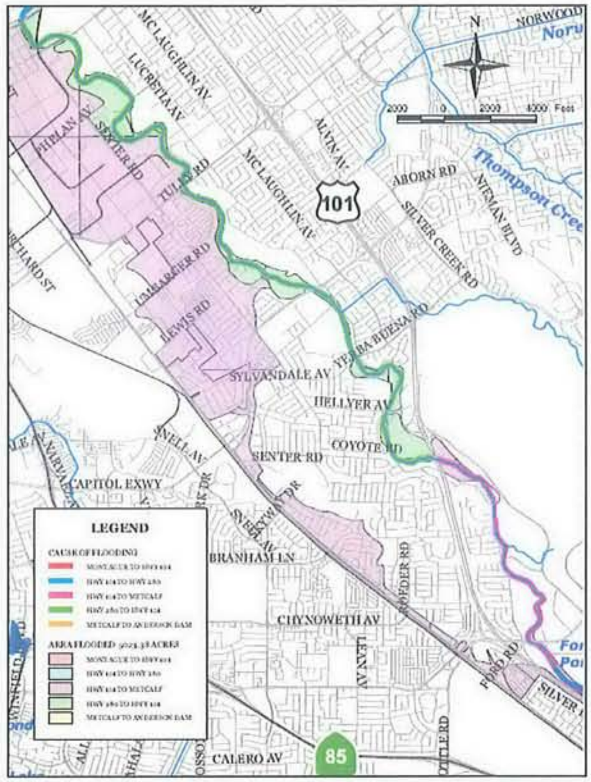


Figure 4.9 Floodplain for Coyote Cr. 280 to Metcalf Rd.

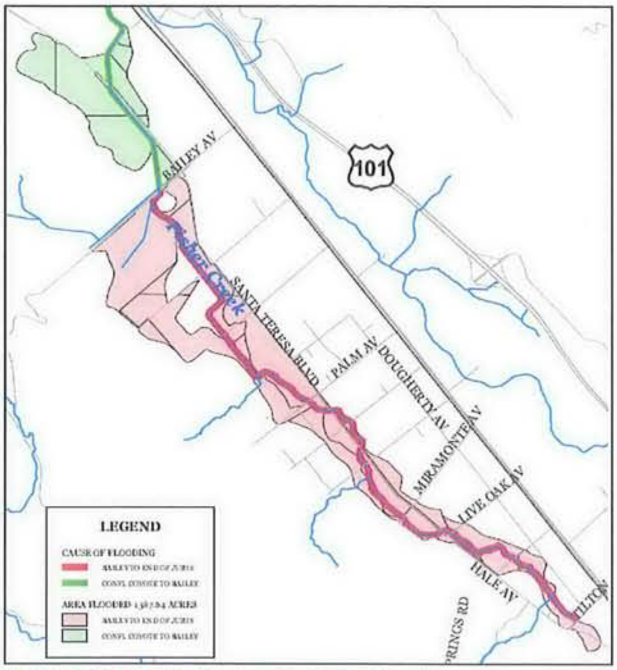


Figure 4.10 Floodplain map for Fisher Creek

4.3.2.1.5 Natural flood protection needs associated with the Uvas/Llagas Watersheds

The Uvas-Llagas Watershed is defined by geographic boundaries encompassing the tributaries and watersheds of the Pajaro River in Santa Clara County. Whereas the other four watersheds drain into San Francisco Bay, the Uvas-Llagas watershed drains into Monterey Bay. The major tributaries are East and West Little Llagas Creeks, Llagas Creek, West Branch of Llagas Creek, Uvas-Carnadero Creek, Pescadero Creek, and Pacheco Creek. The Uvas/Llagas Watershed is comprised of mostly unincorporated areas. It includes the City of Gilroy and portions of the Cities of San Jose and Morgan Hill. The watershed encompasses a 369-square-mile region. The Pacheco Creek sub-watershed is approximately 178 square miles and is largely undeveloped. The Uvas and Llagas watersheds total 191 square miles.

MAIN FLOODING SOURCES AFTER 2016

- *Alamias Creek*
- *Jones Creek*
- *West Branch Llagas Creek*

Since 1982, the district has completed flood protection projects on Uvas Creek, Lower Llagas Creeks, and other creeks and bridges that were part of the Natural Resources Conservation Service's PL-566 program. These projects protect approximately 1,700 parcels. By 2016, an additional 1,400 parcels will be protected from flooding.

Over 1,300 parcels will remain at risk from 1-percent flooding after 2016. 1-percent flooding will occur along Alamias, Bodfish, Center, Church, Corralitos, Crews, Day, Edmundson, Foothill, Hayes, Jones, Lions, Little Arthur, Live Oak, Maple, New, Pacheco, Panther, Rucker, San Martin, San Ysidro, Skillet, Tennant, and West Branch Llagas creeks. The main areas of concern after 2016 will be flooding from Alamias, Jones, and West Brach Llagas creeks. Figures 4.11 and 4.12 show the areas at risk from 1-percent flooding from these creeks.

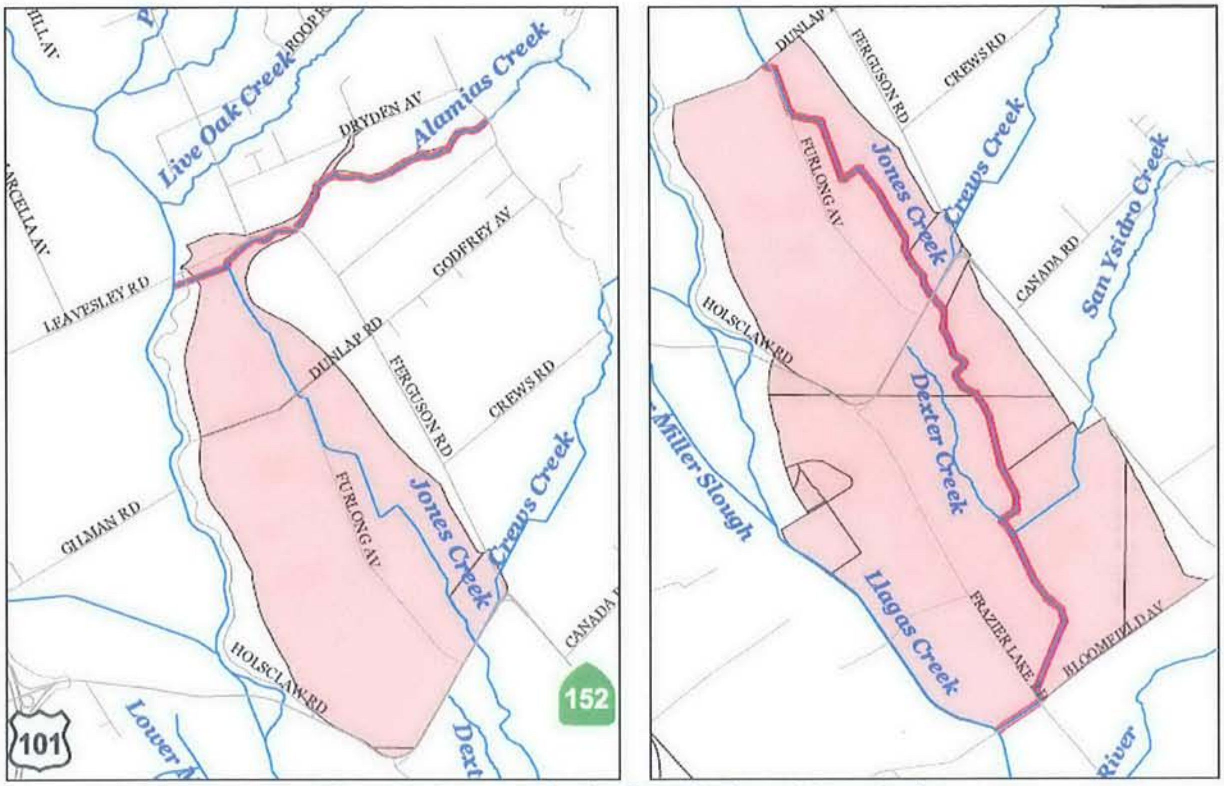


Figure 4.11 1-Percent Flooding from Alamias and Jones Creeks

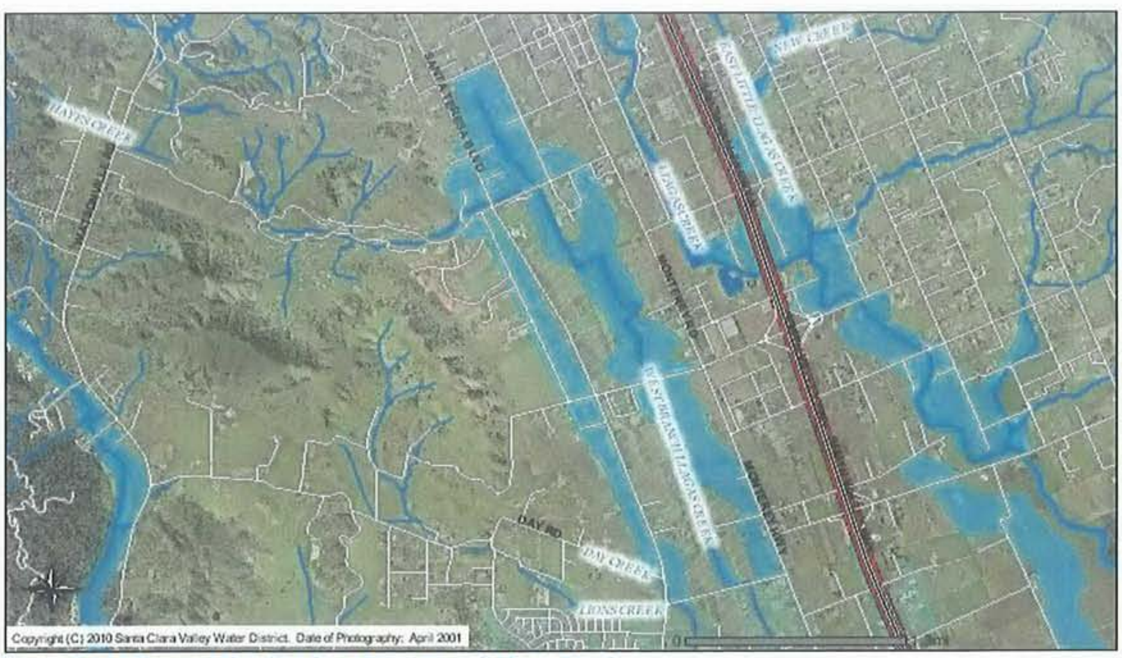


Figure 4.12 1-Percent Flooding from West Branch Llagas Creek

4.3.2.2 Preserve flood conveyance capacity.

The district's programs for stream maintenance and asset management address the objective of preserving flood capacity conveyance. Three factors that could affect the district's ability to preserve flood conveyance capacity and that could generate future *needs* are aging infrastructure, climate change, and changes in federal regulations.

Aging infrastructure presents new challenges for the district. Facilities constructed for flood protection in the late 1950s and early 1960s are now showing signs of wear to some of their components that will require major rehabilitation or replacement in the next planning horizon. For example, gravels transported during high flows have abraded some concrete lined channels to the extent that re-lining of those sections may be required in the future. Other infrastructure has experienced localized failures of facility elements under extreme high flow events. Examples of these failures include several failed concrete panels on Los Coches Creek in 1995 and failed gabion sections on Los Gatos Creek and SanTomas Aquino Creek. Other examples include depressed maintenance roads (roads built within the channel to reach the work areas) that may have to be re-built to conduct sediment removal. These types of non-routine repairs are costly and compete for available funding for normal maintenance activities such as sediment removal, bank protection, and vegetation management.

Climate changes may also generate future *needs* due to the effect of climate change on precipitation patterns. The latest precipitation models show that precipitation patterns will change and that flooding will be flashier than in the past. What is now defined as a 100-year storm may occur in the future as randomly as a 10-year storm does now. The effects of these more frequent and more intense storms on some of the older infrastructure may accelerate the need for rehabilitation. The flashier nature of storms may also alter sediment transport patterns resulting in more erosion on steeper creeks and more sedimentation on flatter creek sections. While this climate change aspect is considered valid, the models are not calibrated sufficiently for use at the local level. Changes in precipitation patterns generated by climate change have not been used to calculate *needs* for this objective. It does, however generate a need to expand the hydrologic data collection network. This need is discussed in goal 2, reduced potential for flood damages.

The third factor that could generate future needs involves changes in federal regulations. Recent examples in 2010 are the U. S. Army Corps of Engineers (COE) levee compliance program and FEMA levee recertification requirements. The additional costs to comply with these requirements could potentially impact available funding for routine maintenance activities.

Needs and opportunities identified to achieve this objective include:

- Develop and implement a sediment source reduction program
- Develop enhanced guidelines and standards for land use near streams with cities, county, and others
- Conduct facility condition assessments for the purpose of identifying, prioritizing, and scheduling channel rehabilitation projects. (This can be a component of asset management.)
- Standardize the district's levee inspection, maintenance, and safety program to comply with COE and FEMA requirements and to meet asset management objectives.

4.4 REDUCED POTENTIAL FOR FLOOD DAMAGES NEEDS AND OPPORTUNITIES

This section summarizes the *needs and opportunities* related to achieving the goal of reduced potential for flood damages.

4.4.1 Reduced Potential for Flood Damages Objectives and Strategies

The goal of reduced potential for flood damages has two primary objectives. These objectives are to reduce flood risks in flood prone areas and to avoid the creation of expanded flood areas.

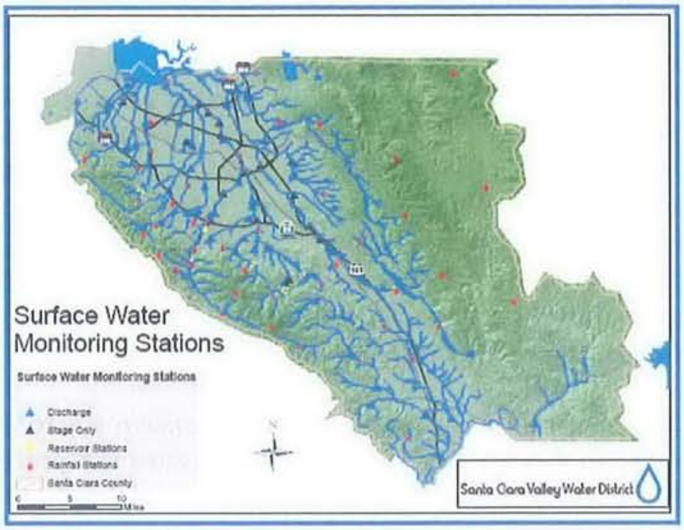


Figure 4.13 Surface Water Monitoring Stations

The first objective is centered on providing flood forecasting and emergency response services. Other activities are aimed at conducting an effective floodplain management program. This entails working with municipalities to clearly identify roles and responsibilities for floodplain management and emergency response; responding to development proposals that could impact district facilities; promoting community awareness about best practices to avoid or minimize exposure to flooding; and working with the Federal Emergency Management Agency to ensure that floodplain maps are based on the best available data.

The second objective is centered around providing technical support on subjects such as flood-wise designs, mitigating erosion, sedimentation, and high flows from new developments; promoting green projects or other practices to manage stormwater runoff and improve water quality; and to promote awareness of the risks for developing in flood hazard areas.

4.4.2 Reduced Potential for Flood Damages Needs and Opportunities

The FPSS program as it exists in 2010 includes various activities that help the district achieve the goal of reduced potential for flood damages. One of these programs is the hydrologic data measurement and management program. The data collected is used for water utility operations, for determining the design peaks and volumes of floods, and for providing the public and cities and county real time information to assist emergency actions to reduce flood damage.

The district has determined that it *needs* to expand the data collection network to meet regulatory requirements for greater accuracy when gauging water diversions, for example. It also *needs* more data collection to develop a flood warning system that can predict stream flows and reservoir spills a few hours before the actual occurrence. As discussed in earlier sections, climate change brings a new unpredictability associated with precipitation patterns. More hydrologic data will be *needed* to fine-tune the models and to make them useful at the local level for reducing the potential for flood damages.

Reducing the potential for flood damages is about reducing flood risk. This is a shared responsibility with the cities and county. For example, cities should not allow development in flood prone areas without first examining the impacts of encroaching on those floodplains. Additionally, when considering developments in flood prone areas, cities should prepare area-specific master plans to describe the strategies and facility improvements needed for the orderly development of those areas. The district role would be to provide the best available data in its possession and to provide technical review of the master plans. With the heightened awareness of sea level rise, this presents an *opportunity* for cities to work together and with the district to prepare a consensus plan on how land use near the bay and tidal protection can be integrated.

A review of the existing programs identified the following *opportunities* to meet the goals and objectives related to this area:

- Expand the hydrologic data collection network with additional streamflow monitoring stations, precipitation stations, and reservoir inflow stations to enhance emergency response and flood preparedness services.
- Continue the development of a flood warning system.
- Pursue opportunities to develop regional detention basins in areas where flood protection facilities are nearing capacity.
- Work with FEMA to develop more accurate flood maps.
- Work with cities, county, state, and federal agencies to develop a consensus plan to deal with tidal flooding and sea level rise.

4.5 HEALTHY CREEK AND BAY ECOSYSTEMS NEEDS AND OPPORTUNITIES

The district endeavors to achieve the goal of healthy creeks and bay ecosystems by conducting vegetation management activities, erosion protection projects, and capital improvements to mitigate project construction impacts. The district also implements enhancement projects and conducts biological and ecological studies to ensure that timely and cost-effective scientific information is available.

This section summarizes the *needs and opportunities* related to achieving the goal of healthy creek and bay ecosystems.

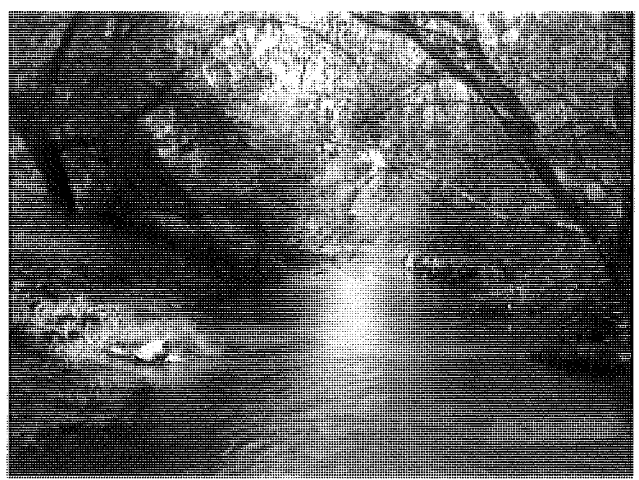


Figure 4.14 Alamitos Creek

4.5.1 Healthy Creek and Bay Ecosystems Objectives and Strategies

The goal of healthy creeks and bay ecosystems has three primary objectives. These objectives are 1) to balance water supply, flood protection, and environmental stewardship functions, 2) to improve

watersheds, streams, and natural resources, and 3) to promote awareness of stream and bay ecosystem functions.

The first objective is centered around activities aimed at protecting and restoring sensitive fisheries and aquatic species while meeting needs for flood protection and water supply; identifying and mitigating impacts to watersheds, stream, and natural resources by capital projects and operations programs; identifying and implementing potential mitigation banking opportunities to streamline future mitigation requirements; and providing information on stormwater management and design of floodplains and channels.

The second objective is centered around implementing stream stewardship opportunities to improve ecological conditions, including environmental enhancements, and seeking to achieve the physical stability and ecological health; engaging in habitat conservation planning; protecting groundwater recharge areas in creeks and riparian corridors; protecting, enhancing, and restoring riparian vegetation and in-stream and tidal habitat conditions; and protecting, enhancing, and restoring populations of key species.

The third objective is centered around providing technical expertise for applying ecosystems functions knowledge; promoting awareness of sensitive groundwater recharge areas; and promoting the preservation of ecological buffers.

4.5.2 Healthy Creek and Bay Ecosystems Needs and Opportunities

A review of the existing programs indicates that there are many stewardship tools already in place at the district. For example, the district has procedures that provide guidance for evaluating and selecting alternatives for natural flood protection projects. The district integrates habitat goals into other efforts or into stand alone environmental projects, including stream restoration and enhancement projects.

Many of the district's efforts to improve watersheds, streams, and natural resources are in connection with water supply or flood protection projects or with stream maintenance activities. These stewardship projects are often mitigation projects to fulfill CEQA and regulatory requirements for both capital projects and operational activities. The district integrates stewardship planning into the CIP and operations project planning by incorporating best management practices and by using stewardship planning guidelines. In addition to these stewardship tools, watershed stewardship plans have been developed to facilitate a consistent and systematic approach for the comprehensive management of water resources on a watershed-by-watershed basis.

Figure 4.15 Stevens Creek Corridor Restoration

Stewardship plans were prepared by the district between 2002 and 2006 for the four northern major watersheds, Lower Peninsula, West Valley, Guadalupe, and Coyote. The watershed stewardship plans, sponsored in part by the CALFED Bay-Delta Watershed Program, have identified a number of *opportunities* for improving watersheds. These *opportunities*

would benefit riparian habitat, tidal and freshwater wetlands, fisheries, special terrestrial species, streams, water quality, and public awareness.

In addition to watershed stewardship plans for the northern watersheds, the Pajaro River Watershed Integrated Regional Water Management Plan (IRWMP) identifies regional and multi-beneficial projects for the Pajaro River Watershed. The IRWMP is a collaborative effort by the Pajaro Valley Water Management Agency, San Benito County Water District, and the district. These planning documents have identified numerous opportunities for projects that would improve healthy creek and bay ecosystems.

Under the Ecological Monitoring and Assessment Program a scientific, standardized and systematic approach is being implemented to establish targets for the health of stream ecosystems and to assess and report their condition. This on-going effort will help to identify future risks to achieving targets for healthy streams, identify future needs and opportunities to improve their conditions and inform priorities for making investments in stream ecosystem health. This effort will also identify priorities for filling additional needs for information on the health of streams and assist planners and designers in identifying project-specific habitat goals and plans.

Specific *needs and opportunities* are described in the following sections.

4.5.2.1 Needs and Opportunities for Improving Riparian Habitat

Riparian habitat refers to the riverside or riverine environment and other terrestrial environments on the banks of freshwater bodies and watercourses. Riparian habitats generally occupy the transition zone between aquatic habitats and upland habitats. There are numerous benefits to healthy riparian habitats. They provide food and cover to a number of biological communities as well as migration corridors and connectivity to other habitats. They also provide stream bank protection from erosion. Opportunities for improving riparian habitat include:

Figure 4.16 Natural riparian habitat

- Restore concrete lined sections of creeks to natural conditions, such as on San Tomas Aquino Creek upstream of Williams Road. In addition to improving riparian habitat, this multi-objective project offers opportunities to improve groundwater recharge, flood protection, and trails and recreation.
- Continue programs to reduce or eliminate invasive plant species beyond permit requirements. Revegetate those areas with native species.
- Re-plant un-vegetated banks with native vegetation.
- Provide riparian habitat on artificial flood control channels.
- Preserve the remaining natural stream channels and riparian communities.
- Enhance and restore off-channel percolation ponds adjacent to Guadalupe Creek.

4.5.2.2 Needs and Opportunities for Improving Fisheries

Various streams throughout Santa Clara County have viable aquatic ecosystems with the ability to support both warm-water and cold-water fisheries. Watershed stewardship plans have identified both cold-water and warm-water fisheries as watershed health indicators. An indicator is a feature that may be evaluated to provide a measure of progress towards attaining stated objectives.

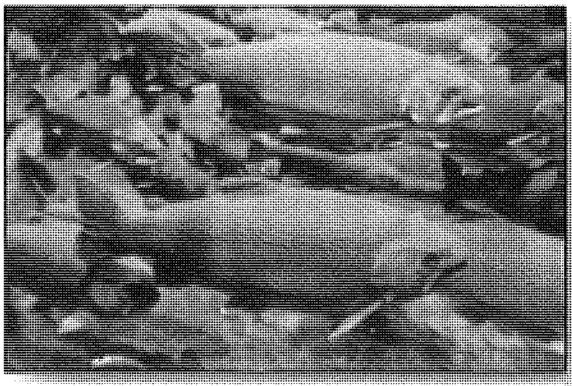


Figure 4.17 Migrating salmon

Some of the highest quality habitats are found in the upper reaches of streams such as Adobe Creek, Los Trancos Creek, Bear Creek, Upper Penitencia Creek, Saratoga Creek, Guadalupe Creek, Coyote Creek, Uvas Creek and Bodfish Creek, to name a few. However, these creeks have numerous impediments to fish passage that limit fish migration and fish spawning. These impediments to fish passage include perched streambeds without well-defined low flow channels, crushed or raised culverts, and other constraints that prevent migration under certain flow conditions. Other conditions that affect cold-water fish migration are water bodies that may harbor predators or cause water temperatures to increase, such as occurs on the Ogier Road ponds, Coyote percolation ponds, and Almaden Lake.

Opportunities for improving fisheries include:

- Remove remaining fish barriers on Stevens Creek, , Alamitos Creek, Coyote Creek, Uvas Creek, Llagas Creek, and in the upper reaches of Saratoga Creek
- Restore reaches of Stevens Creek, Coyote Creek, Uvas Creek, Guadalupe Creek and Alamitos Creek to enhance fisheries
- Provide separation of main channels from adjacent water bodies on Coyote Creek, and Llagas Creek to reduce warming effect on stream flows and to protect migrating fish
- Separate Almaden Lake from Alamitos Creek
- Provide gravel augmentation below dams to improve spawning areas at Stevens, Anderson, Almaden, and Guadalupe dams
- Consider fish passage opportunities at district dams to restore connectivity to upper watersheds

4.5.2.3 Needs and Opportunities for Improving Tidal/Freshwater Wetlands

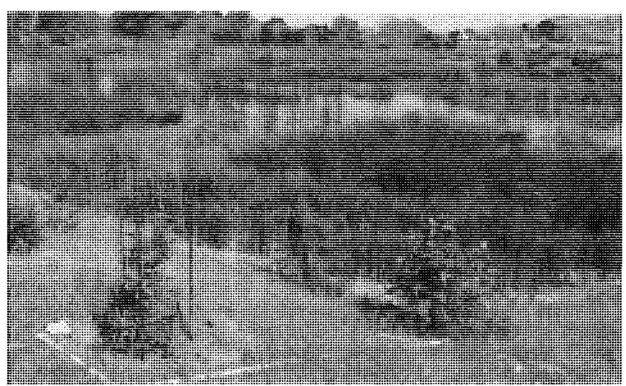


Figure 4.18 Coyote Parkways wetland

The South Bay Salt Pond Restoration Project offers many opportunities for the creation of wetlands. District efforts to improve healthy creek and bay ecosystems include projects such as the Island Ponds Restoration Project and freshwater wetlands projects at Coyote

Parkways Lake and the Carnadero Preserve. Additional opportunities to create wetlands include:

- Create a transition zone between fresh water habitat and tidal marsh restoration in connection with South Bay Salt Pond Restoration Project
- Provide an opening to the tidal marsh on Stevens Creek for the Crittenden Marsh.
- Develop environmental enhancement opportunities in the Pajaro Watershed
- Improve riparian and ecosystem habitats in Thompson Creek downstream of Quimby Road

4.5.2.4 Needs and Opportunities for Reducing Channel Erosion/Instability

Many streams have a history of channel instability and contribute to water quality degradation, loss of riparian habitat, threats to adjoining property, and loss of channel conveyance in downstream reaches. The district should perform causal analyses to determine the factors contributing to the instability. Whenever possible, adopt regional or reach wide solutions for correcting the channel instability rather than repairing the eroded streams on a site-by-site basis. When doing these types of projects, integrate additional opportunities for improving riparian corridors or other habitats.

Integrate channel stability efforts with other concurrent watershed efforts, such as asset management and sediment reduction programs. Opportunities to reduce channel instability include:

- Reduce channel erosion sites or instabilities in the main stem of Stevens Creek.
- Reduce the impacts of contaminated sediment in the existing banks of Alamitos Creek with erosion control projects.

4.5.2.5 Needs and Opportunities for Assessing the Health of Stream Ecosystems

The three objectives established to achieve the goal of healthy creek and bay ecosystems require information on the health of the creek and bay ecosystems. Currently, that information is generated on an as-needed basis for specific projects and programs. Project-based information designed to meet the needs of individual projects is limited geographically and often has little applications beyond the project-specific purpose. The district's Ecological Monitoring and Assessment Program (EMAP) Framework is a comprehensive, scientific and cost-effective approach for generating an integrated picture of stream ecosystem health on a watershed basis. It is designed to provide information that can be used to set goals for attaining habitat conditions, identify key areas of ecological risk to stream ecosystem health and identify priority investment decisions for targeting management actions to best improve the health of stream ecosystems. The EMAP Framework will be implemented using a phased approach watershed by watershed to generate stream ecosystem health profiles. These profiles will initially establish performance targets for stream ecosystem health and identify *needs and opportunities* for improving conditions. The profiles will be updated periodically to assess condition over time, evaluate the effectiveness of management actions taken to improve condition, and identify emerging issues.

4.6 CLEAN SAFE WATER IN OUR CREEKS AND BAYS NEEDS AND OPPORTUNITIES

Activities to prevent pollution and to reduce the impact of pollution in Santa Clara County creeks and San Francisco and Monterey bays support the goal of clean safe water in our creeks and bays. These

activities ensure the safety of drinking water, detect and monitor toxic materials and sediments, protect ecosystems, and provide hazardous-material emergency response at district facilities.

This section describes the *needs and opportunities* to improve the district's ability to achieve the goal of Clean Safe Water in Our Creeks and Bays.

4.6.1 Clean, Safe Water in our Creeks and Bays Objectives and Strategies

The goal of clean, safe water in our creeks and bays has two primary objectives. These objectives are to preserve or improve surface and groundwater quality for beneficial uses and to promote awareness of water quality and stream stewardship.

Activities that support the first objective include partnering with the county, cities, and other agencies on urban runoff pollution prevention programs; providing hazardous materials management and incident response; improving water quality of impaired water bodies; coordinating and participating in trash removal and graffiti removal programs; and protecting surface water quality. Activities that support the second objective include providing public and school education and outreach and partnering with the county and cities on general surface water quality protection programs and outreach.

4.6.2 Clean, Safe Water in our Creeks and Bays Needs and Opportunities

Achieving the goal of Clean, Safe Water in Our Creeks and Bays relies on more than the district's effective execution of its current programs and projects. It also relies on cities and regulatory agencies exercising control and enforcement over activities within their jurisdictions that contribute to pollution and reduce water quality.

The district provides hazardous materials response at district facilities, participates with cities and the county in cleaning up litter and cleaning graffiti, facilitates the protection of groundwater recharge areas, and improves water quality of listed impaired water bodies owned by the district. The district does not have jurisdiction over most of the sources of these polluting activities. The district only has 'technical' and 'collaborative' capacity to influence most clean water and pollution prevention activities. Therefore, along with local communities and resource agencies, the water district is playing an active role in protecting water quality in local creeks and in the San Francisco and Monterey bays. To meet the clean safe water objectives it may be necessary for all affected groups to expand existing pollution prevention programs, create new partnerships with local government, address upcoming total maximum daily load (TMDL) regulations for pollutants in waterways, and provide additional trash removal from waterways.

CLEAN, SAFE WATER PROGRAMS

- *Public Outreach and Education*
- *Impaired Water Bodies Improvement*
- *Good Neighbor Maintenance*
- *Illegal Encampment Cleanup*
- *Source Water Protection*

In FY 2011, the district's role, in cooperation with other agencies, is to promote awareness of water quality and stream stewardship and to clean up pollutants after they enter streams or other district-owned water bodies. The following sections identify opportunities for specific elements of the clean, safe water programs.

4.6.2.1 Opportunities for Improving Public Outreach and Education

The district's outreach and education efforts include the Adopt-A-Creek program, direct participation at community events to promote Adopt-A-Creek, cleanup events, and school outreach programs. In addition, the district participates in the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) public outreach programs. These programs include the Watershed Watch Campaign, Schools and Youth Education Outreach program, Watershed Watchers Program at the Don Edwards San Francisco Bay National Wildlife Refuge Environmental Education Center (EEC), and the Our Water Our World program.

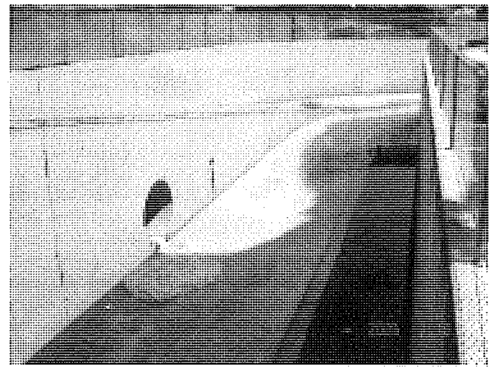


Figure 4.19 Matadero Creek

The district can better achieve the objective to promote awareness of water quality and stream stewardship by strategically committing more resources for public outreach and education and training and by promoting awareness of the causes and prevention of trash and pollution. Another way to improve this area is to expand regional pollution prevention outreach with SCVURPPP.

4.6.2.2 Impaired Water Bodies

The district is responsible for TMDL requirements as owners of water bodies. As identified in the district's 2007 Revised Impaired Water Bodies Improvement Program Plan, additional studies will be needed to see if there are feasible pollutant control and treatment methods available for mercury, PCBs, chlordane and dieldren in Anderson and Stevens Creek Reservoirs. These water bodies are considered impaired because some fish contain concentrations of these pollutants that exceed applicable standards or because some water samples are toxic to laboratory test species. Sources of these pollutants are unknown, but are generally associated with sediment. The district does not own existing sources of these pollutants, but does own the reservoirs.

Under section 303(d) of the Clean Water Act, states, territories, and authorized tribes are required to develop lists of impaired waters. These are waters that are too polluted or otherwise degraded to meet the water quality standards set by states, territories, or authorized tribes. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop TMDLs for these waters. A Total Maximum Daily Load, or TMDL, is a calculation of the maximum amount of a

The district supports the Regional Water Quality Control Board and Environmental Protection Agency regulations in reducing pollutants in our waterways. This includes evaluation and prioritizing actions to address pollutant sources under district ownership and/or control. Other agencies and owners are responsible for their facilities. It is also beneficial for all parties to work together to eliminate pollutants from entering streams and waterways in the first place.

The district is currently conducting pilot studies in some reservoirs and plans to install a circulating system in Stevens Creek in 2012. Furthermore, the 2007 Revised Impaired Water Bodies Improvement Program Plan also calls for continued efforts (through SCVURPP). The district identified the following opportunities for this anticipated work:

- Assess pollutant sources and controls available
- Expand trash control and abatement program and partnerships
- Develop specific projects to address regulatory Total Maximum Daily Load (TMDL) requirements for district owned water bodies
- Implement mercury removal systems in district reservoirs
- Perform feasibility study regarding possible removal of Almaden Dam

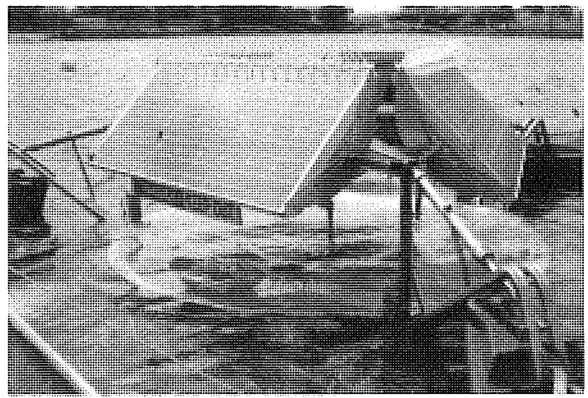


Figure 4.20 Solar-powered circulator

4.6.2.3 Good Neighbor Maintenance: Trash and Litter Removal

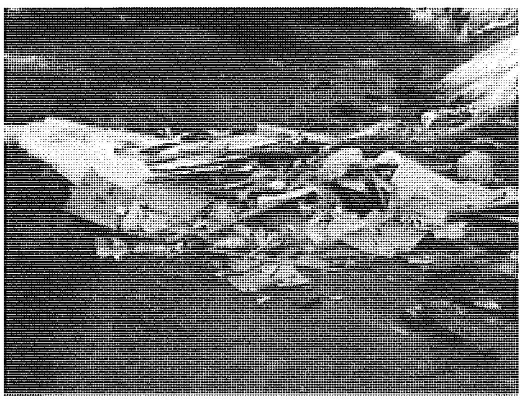


Figure 4.21 Trash dumped in creeks

The district currently has trash and large debris removal programs. The district conducts trash removal under the good neighbor maintenance program and through the Adopt-a-Creek programs. The district also conducts routine and emergency debris removal to preserve the existing floodwater conveyance capacity in creeks and protect healthy creek and bay ecosystems. In addition to the district's efforts, local communities and resource agencies are also assisting with trash removal from waterways. The cities and the county have distinct roles and responsibilities in trash removal and cleanup. The district could improve its efforts to meet the goal of clean safe water by increasing public outreach and working more closely with city agencies to reduce pollution before it enters the creeks and waterways.

The cities, the county and the district will need to work together to seek innovative ways to eliminate trash from streams. They need to evaluate measures that prevent trash from getting into streams in the first place. An example is the LA Gateway Cities Catch Basin Insert Project. This has been lauded as a major environmental project that will help 16 cities prevent more than 840,000 pounds of trash each year from entering the Los Angeles River. Other cooperative efforts may include:

- Coordinate with municipalities when they install storm drain inlets and outlets to prevent trash and debris from entering the waterways
- Increase public outreach and work more closely with municipalities to aggressively reduce trash and litter

4.6.2.4 Illegal Encampment Cleanup

Under an agreement between the district and the City of San Jose, the Police Department provides support to homeless encampment cleanup activities. There is a need for more consistent funding and resource commitment from these agencies. This program would benefit from a longer-term commitment by the City of San Jose and the Police Department for continued assistance and collaboration.


Figure 4.22 Illegal encampment

In addition, the district can improve the program by adding an element to remove human biological waste at these encampments, which is a potential impact to water quality in Guadalupe River and Coyote Creek. If not addressed, this homeless issue could lead to an increased water quality monitoring requirements by the Regional Water Quality Control board and to Pathogen TMDL requirements in the in the future. There is an opportunity to minimize the impacts of illegal encampments:

- Expand work with City of San Jose and the Police Department to prevent homeless encampments in creeks

4.6.2.5 Source Water Protection

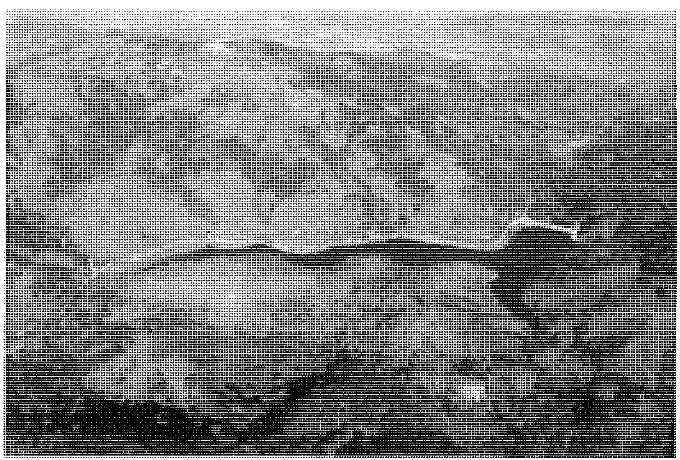


Figure 4.23 Almaden Reservoir Watershed

The District's source waters are susceptible to potential contamination from a variety of land use practices such as agricultural and urban runoff, recreational activities, livestock grazing, and residential and industrial development. In addition, local sources are also vulnerable to potential contamination from commercial stables, industrial groundwater contamination, septic systems and sewage spills, and historic mining practices.

Although the district does not have control over many activities in the watersheds that drain into its reservoirs, it has implemented many source water protection measures. As a result, the district has maintained high quality source waters in its reservoirs. Future watershed programs developed within the context of this master plan should consider the need for increased focus on water quality and source water protection activities above the reservoirs.

One opportunity for exercising greater control of activities in the watersheds above district reservoirs would be to implement a land or easement acquisition program for source waters above the district's

two terminal reservoir systems- Anderson/Coyote and Calero/Almaden. This acquisition program should be integrated with open space acquisition programs to achieve multiple watershed-based objectives.

4.7 TRAILS, OPEN SPACE AND WATER RESOURCE MANAGEMENT NEEDS AND OPPORTUNITIES

The district collaborates with cities and the county to provide public access to creek-side trails and parks. This includes trail opportunities identified in the County Trail Master Plan: Upper Llagas Creek, Sunnyvale East and West Channels, Upper Guadalupe River, Berryessa Creek and Permanente Creek.

The Clean, Safe Creeks special tax funds the trails and open space objective of identifying and providing public access to 70 miles of trails or open space by 2016. Although the district is not a park, trails, and open space agency, it has been the policy of the district since the early 1970s to allow diversified uses of district property to the greatest extent compatible with the primary use of such property. The district allows use of its property on the condition that the use is the full responsibility of a properly empowered public agency.

The District will meet its Clean Safe Creek commitment of providing 70 miles of trails by 2016. The district can develop a plan to work with others to further extend trails. This section summarizes the needs and opportunities.

4.7.1 Trails and Open Space Needs and Opportunities – Programmatic

The district and neighboring cities and county have long recognized that creeks offer opportunities to develop linear city and countywide park and trail systems. These systems would extend finger-like park and open space projections into residential neighborhoods and downtown areas. Creeks and other water bodies can provide environmental experiences and recreation activities not possible in neighborhood parks.

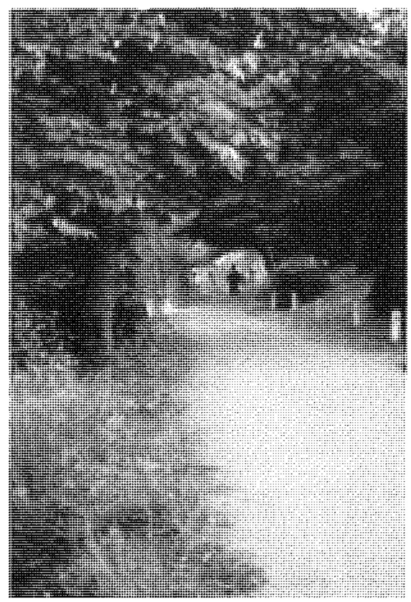


Figure 4.24 Saratoga Creek

This system of trails and open space would enable the public to travel throughout the valley floor by means of hiking trails and bike trails. With an urban design that provides for space for natural frontages along creeks, motorists and pedestrians alike would be provided with enjoyable scenic experiences. Another benefit afforded by these concepts is that theses street designs would maximize the protection of sensitive ecological environments.

The district has a long association with cities and the county for supporting additional trails, parks, and open space along creeks, watersheds and San Francisco Bay. It has done this by providing access to its lands where appropriate. Providing this access has also supported creek-side or water related recreation. Since 2000, the district collaborations with cities and the county have resulted in 65.5 miles of trails and provided new access to 150 acres of open space. Agencies that have collaborated with the district to construct 30 trails projects include Santa Clara County and the cities of Campbell, Cupertino,

Gilroy, Milpitas, Morgan Hill, Mountain View, San Jose, Santa Clara, and Sunnyvale. The district is on track to meet its Clean, Safe Creeks commitment on trails by 2016.

For the planning horizon after 2016, stakeholders have suggested that the district build upon successes of cooperative efforts, such as the Stevens Creek Corridor Trail and Stevens Creek Restoration Project at Blackberry Farms, as a model for other trails and open spaces partnerships. There are opportunities for continued or expanded district efforts to support regional efforts by other agencies to expand trail development for public and district benefit. Two examples of these are the County Trails Master Plan and the Bay Area Ridge Trail.

The future program could include additional support in these efforts especially for those projects that meet objectives shared with partner agencies. The future FPSS program could include an element whereby the district provides planning assistance to other agencies or groups with their trail project planning.

District staff identified four options, and combinations thereof, for developing a trails program component for the next planning horizon of the FPSS:

Figure 4.25 Downtown Guadalupe River Trail

- Continue financial support for trails programs, should voters approve such support.
- Identify and recommend to partner agencies potential locations for trail development on district property
- Identify and consider funding trail opportunities during planning and design of district capital projects

When evaluating trail opportunities, the district should consider the appropriateness of locating trails within riparian corridors. Trails may not be suitable for all areas, due to the presence of existing or potential wildlife, and/or riparian or wetland habitat. Trails can be intrusive, impacting local habitats and segregating habitat areas from each other.

Regarding open space, stakeholders commented that there is a nexus between agricultural land conservation and open space. Agricultural lands are a type of open space, in contrast to land developed with impervious surfaces. Therefore, the district should consider investigating existing agricultural land conservation programs for inclusion into open space opportunities. Stakeholders also recommended that the district support open space projects whose objectives benefit watershed health and habitat connectivity.

4.7.2 Trails and Open Space Needs and Opportunities – Project Based

Stakeholders have identified opportunities for increasing public access to potential trails and open space along creeks, watersheds, and the bay. Specific areas that are candidates for future trails include Coyote

Creek, Stevens Creek, the San Francisco Bay shoreline, and the South Bay Salt Pond Restoration Project. Stakeholders and watershed stewardship plans identified specific trail and open space opportunities in Table 1.

Table 1 Trail and open space opportunities

Creeks and Water Bodies	Description
Alamitos Creek	There are opportunities for additional joint use agreements between the City of San Jose, the County, SCVWD and Mid-Peninsula Regional Open Space District.
Alamitos Creek	Increase access to open space, including provisions for joint trail heads, parking, and public facilities
Matadero Creek	Opportunities for open space protection in upper watershed
Stevens Creek	Continued support of open space in upper watershed
Alamitos Creek	Increase recreation at Almaden Lake (with and without a bypass to separate Almaden Lake from the main channel of Alamitos Creek)
Calabazas Creek	Restoration of creekside trails on lowered floodplain at Calabazas Park (potential NFP element of Miller to Wardell project)
Los Gatos Creek	Connect Los Gatos Creek Trail to the Guadalupe River Park Trail at Arena Green
Permanente Creek	Design Permanente Creek Trail System
San Tomas Aquino	Opportunity for extending the San Tomas Aquino Creek Trail
Saratoga Creek	Use bike lanes and routes of Saratoga Creek trail between Bollinger Road and English Drive to provide access to Prospect Road via Johnson Avenue.
Saratoga Creek	Opportunities for Saratoga Creek trail from Bollinger Road to Barnhart Avenue and on street along Barnhart and Tantau Avenues into the City of Santa Clara.
Stevens Creek	Potential future Stevens Creek trail connection upstream of El Camino to reservoir
Sunnyvale East and West	Study potential of future link to Bay Trail and to Moffett Park Drive
San Tomas Aquino Creek	Bridge and Trail Extension upstream of Silacci Bridge, crossing from Westmont high school to Forest Hill elementary school
Coyote Creek	Bay Trail Reaches 9 and 9B
Coyote-Alamitos Canal	Trail from Almaden Lake to Santa Teresa County Park
Uvas Creek	Trail from Santa Teresa Blvd to the Debell Uvas Open Space Preserve
Lions Creek	Trail along Lions Creek from Santa Teresa Boulevard to Kern Ave
Tennant Creek	Trail along Tennant Creek between Dunne Avenue and Hill Road
Guadalupe Creek	Trail from Singletree Way to Almaden Quicksilver Park
Golden Oak Park Trail (or Almaden Valley Loop Trail)	Almaden Expressway to Guadalupe Creek trail near Singletree Way

4.7.3 Greenhouse Gas Emissions Reduction Needs and Opportunities

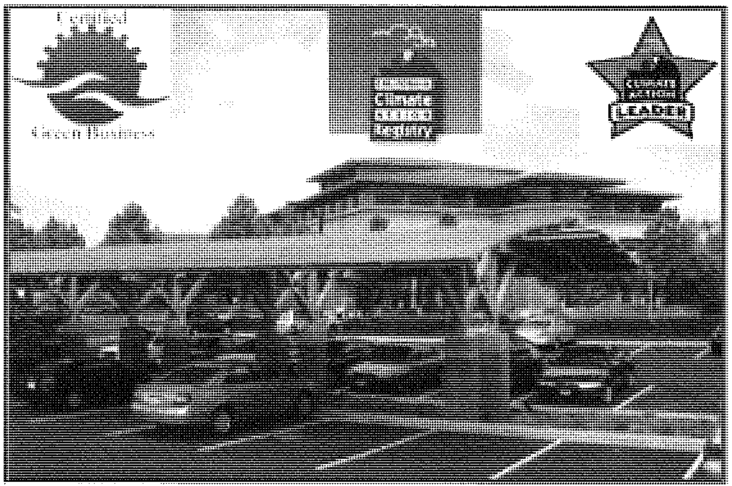


Figure 4.26 District alternative energy project

The district's strategies to reduce greenhouse gas emissions focus on direct emissions from existing operations. Activities, such as water conservation related reductions, carbon sequestrations from wetlands, or riparian habitats restored, reduce the communities' carbon footprint and provide opportunities for carbon credit.

Additionally, the district's energy portfolio contains zero emission solar and hydropower supplies with the potential for expansion.

Needs and opportunities to meet the objective to reduce greenhouse gas emissions when reasonable and appropriate include:

- Expand the benefits of wetlands carbon sequestration by increasing acreage of wetlands or riparian habitats
- Expand hydropower or solar energy supplies in anticipation of future carbon credit banking opportunities
- Estimate future increases in the district's carbon footprint from the construction, operation or maintenance of the flood protection assets, and integrate with regional efforts to reduce greenhouse gas emissions when reasonable and appropriate
- Explore opportunities for managing stormwater with green infrastructure

Appendix C

Brief Descriptions of Candidate Capital Flood Projects

Appendix C1: Candidate Capital Flood Project Element Description Forms, Short list as of October 31, 2011

1. San Francisquito Creek, SF Bay to Middlefield Rd.
2. Upper Penitencia Creek, Coyote Creek to Dorel Dr.
3. Upper Berryessa Creek, upstream of Hwy 680
4. Upper Llagas Creek, Buena Vista to Wright Ave.
5. Shoreline Study

Appendix C2: Project Descriptions, Early Screening Versions, Spring 2011 - these projects may not have proceeded within selection process

Lower Peninsula/ West Valley Watershed

1. San Francisquito Creek, SF Bay to 101
2. San Francisquito Creek – 101 to Searsville Dam, Construction Phase
3. Stevens Creek from Highway 101 to Permanente Diversion
4. Stevens Creek, Highway 280 to Stevens Creek Dam
5. San Tomas Aquino Creek Flood Protection Project – SPRR to Williams Rd.
6. San Tomas Aquino Creek Flood Protection and Restoration Project – Williams Road to Westmont Debris Basin

Guadalupe Watershed

1. Canoas Creek – Guadalupe River to Cottle Road
2. Alamitos Creek – Planning, Design, Construction

Coyote Watershed

1. Upper Penitencia Creek – Coyote Creek to Dorel Drive Construction Phase
2. Mid-Coyote Creek Flood Protection Project (~~R6~~ 4-R8b)
3. Mid-Coyote Creek Flood Protection Project (~~R9~~ – R14) 4 ← 6 - 14
4. Calera Creek – Berryessa Creek to Upstream hwy 680
5. Quimby Creek – Thompson Creek to Murillo Avenue 9 - 14
6. South Babb Creek- Lower Silver Creek to Upstream of Clayton Road Calera

Pajaro Watershed

1. Jones/ Alamias Creeks
2. West Branch Llagas Creek

Multiple Watersheds

1. San Francisco Bay Shoreline

Goal 5: Natural Flood Protection Capital Projects

Element: Upper Penitencia Creek- Coyote Creek to Dorel Drive Construction

Safe, Clean Water Goal:	(5) Natural Flood Protection
Supports Goal(s):	1, 4
Activity Category:	5.2.0 NFP Capital
Element:	Upper Penitencia Creek- Coyote Creek to Dorel Drive Construction
Location:	Upper Penitencia Creek, from Coyote Creek to Dorel Drive San Jose
Owner:	Liang Lee
Subject Matter Expert(s):	Dennis Cheong
Element Goal:	This project partners with the U. S. Army Corps of Engineers (COE) to plan, design, and construct improvements along 4.2 miles of Upper Penitencia Creek from the confluence with Coyote Creek to Dorel Drive. This project will accomplish the following objectives: • Provide 1-percent flood protection to more than 7,000 homes, businesses, and public buildings • Mitigate for project impacts • Improve stream habitat values and fisheries potential • Reduce sedimentation and maintenance requirements • Improve water quality on Coyote Creek by preventing sediment deposits from forming a blockage at its confluence with Upper Penitencia Creek • Identify opportunities to integrate recreation improvements consistent with the City of San Jose's and Santa Clara County Park's Master Plan
Objectives/ Deliverables:	• High-flow diversion channel (from King Road to Coyote Creek) to preserve the natural, low-flow channel. • Open space/parkland to serve as a modified floodplain to preserve natural channel. • Possible trail and park elements via collaborations with City of San Jose and Santa Clara County, consistent with Tri-Party agreement and City and County Park Master Plans. • Possible sediment basins to reduce sediment load on Upper Penitencia Creek and through to Coyote Creek • Possible modifications of existing water diversion structures to improve use of water rights and protect habitat.
Total Cost:	The scope, schedule and costs of the remaining design and construction phases will be determined at the completion of planning. Current estimate from Corps is $139.5 million
Estimated Funding from SCW Program:	$41.9 M
Costs Based on:	This amount has been identified as the Unfunded Local Share. September 2010 Corps estimated cost at $139.5 M SCVWD share estimated based on: • SCVWD would be responsible for LERDS • SCVWD total share would include: Lands, Utilities, the structural work associated with bridges & utilities, and a share of the planning, design, project management work for an estimated total of $59.2M. • This is 42% of total cost, which is mid-way within the normal cost-

	share range of 35% - 50% for local partner. • Total ROW cost estimated by COE is $28.8M • SCVWD has already budgeted/spent $17.3 M • Remaining SCVWD share estimated at $41.9 M The construction completion schedule will greatly depend on the congressional appropriation for the project.
Benefits: **(economic, other)**	• Addresses $11.1 M in average annual damages -- $442.7 M in 1% damages for more than 7,000 parcels – calculated with FEMA's HAZUS damage calculation program in 2011. • Improve stream habitat values and fisheries potential • Reduce sedimentation and maintenance requirements • Improve trails and open space • Improve water quality on Coyote Creek by addressing sediment blockages formed from Upper Penitencia Creek sediment load. • Provide updated maintenance guidelines and Operations and Maintenance Manual for Upper Penitencia Creek • Relieve property owners of the burden of paying for flood insurance.
Relation to Existing CSC 2000:	This active and ongoing project was not funded under CSC 2000

Additional Notes:

- Requires Congressional appropriations to fund design and construction of the project.
- Currently not sufficiently funded either locally or federally
- Flooding has occurred on Upper Penitencia Creek in each instance of severe flooding since district staff began preparing flood reports in 1967.
- References:
  - Waterways Asset Management Plan (AMP), Upper Penitencia Creek Evaluation, November, 2010
  - Upper Penitencia Creek Maintenance Guidelines
  - SCVWD Flood Reports dated 1967, 1978, 1980, 1982, 1983, 1986, 1995, 1996-97, and 1998

Goal 5: Natural Flood Protection Capital Projects

Element: San Francisquito Creek, SF Bay to Middlefield Avenue

Safe, Clean Water Goal:	(5) Natural Flood Protection
Supports Goal(s):	4
Activity Category:	5.2.0 NFP Capital
Element:	San Francisquito Creek, SF Bay to Middlefield Avenue
Location:	San Francisquito Creek, SF Bay to Middlefield Ave. Border between cities of Menlo Park/East Palo Alto and Palo Alto; counties of San Mateo Co. and Santa Clara Co.
Owner:	Chris Elias
Subject Matter Expert(s):	Saeid Hosseini Kevin Sibley
Element Goal:	This project is sponsored by the San Francisquito Creek Joint Powers Authority (JPA), of which the District is a member agency, in partnership with the U.S. Army Corps of Engineers (COE), to provide flood protection along San Francisquito Creek from San Francisco Bay to Searsville Dam. The project is intended to meet the following objectives: • Provide 1-percent flood protection to 3260[1] parcels in Santa Clara County – additional parcels will be protected in San Mateo County. • Reduce bank erosion and sedimentation-related impacts along San Francisquito Creek • Avoid potential adverse impacts on fish and wildlife habitats • Minimize impacts to the creek's environmental resources and restore the riparian corridor where feasible
Objectives/ Deliverables:	• Modify bridges: University Avenue, Pope Chaucer Street, Middlefield Road and Newell Road, Hwy 101 • Widen channel constrictions • Construct floodwalls • Construct offset levees • Lower the levee at the Faber Tract on the East Palo alto/ San Mateo County side of creek • Construct new marsh plain terraces
Total Cost:	Estimated at $128 M
Estimated Funding from SCW Program:	$26 M
Costs Based on:	1. Recommendation from SPM Saeid Hosseini and direction from Melanie Richardson to fund initial bridge work ($10 M for University Avenue and Pope/Chaucer Street bridges). Direction based on e-mails dated 8/10/11, summarized below. The recommendation is based on combined benefits associated with replacing University Avenue and Pope/Chaucer Street bridges in conjunction with construction of two other bridges at Newell Road and Middlefield Road which would be funded with Caltrans grants. 2. JPA receiving $8 M in DWR grant funding 3. A 65-35 cost share agreement between the COE and the JPA for construction. SCW funding is expected to be 50% of the JPA

[1] The Downstream project protects 39 parcels in Palo Alto, the Santa Clara County side of the creek.

	contribution or 17.5% of the total construction cost. 4. West Bayshore, Hwy 101, and East Bayshore bridges will be replaced by Caltrans.
Benefits: (economic, other)	• Addresses \$11M in average annual damages, over \$300M in 1% damages in both San Mateo and Santa Clara Counties; calculated by the Corps of Engineers in 2011. (\$3 M in average annual damages -- \$90 M in 1% damages for 3,340 parcels on Santa Clara side of creek). • In addition to providing flood protection for 3,340 parcels in Palo Alto, which include the Palo Alto Airport and Golf Course, athletic fields, a school and businesses, the project will also protect homes and businesses in East Palo Alto and Menlo Park. Partner agencies from San Mateo County will also provide funding. • Provide new or improved habitats for endangered species and enhanced recreational opportunities for the community. • Eliminate the need for flood insurance for a number of property owners.
Relation to Existing CSC 2000:	Planning and design for this element was funded under CSC 2000 No construction funding was allocated under CSC 2000

Additional Notes:

- The Early Implementation Project (downstream of Highway 101) would need to be completed prior to the Upper San Francisquito project, to ensure adequate conveyance capacity.
- NGOs have expressed support for the removal of invasive, non-native plant species and for more restoration components.
- Reference: San Francisquito Creek Flood Reduction Alternatives Analysis, Phillip Williams & Associates with H. T. Harvey and Associates, July 17, 2009

Goal 5: Natural Flood Protection Capital Projects

Element: Upper Upper Berryessa Creek- Upstream of Highway 680

Safe, Clean Water Goal:	(5) Natural Flood Protection
Supports Goal(s):	1, 4
Activity Category:	5.2.0 NFP Capital
Element:	Upper Upper Berryessa Creek- Upstream of Highway 680
Location:	Upper Berryessa Creek, upstream of Highway 680 San Jose
Owner:	Liang Lee
Subject Matter Expert(s):	Stephen Ferranti
Element Goal:	This project completes construction on the uppermost section of the "Upper Berryessa" project, upstream of Highway 680. This project will accomplish the following objectives: • Provide 1-percent flood protection to 500 homes, businesses, and public buildings (per Corps; SCVWD estimate using FEMA and shallow flooding maps shows up to 1,600 parcels subject to flooding) • Preserve one mile of streamside public open space, including mature oaks • Reduce sedimentation and maintenance requirements
Objectives/ Deliverables:	Major project component is a one- mile bypass to provide 1% protection while avoiding construction work in Berryessa Creek park. Project will also use floodwalls, levees, and habitat enhancement features.
Total Cost:	Estimated at $29 M
Estimated Funding from SCW Program:	$29 M
Costs Based on:	Estimate prepared 9/27/11 by Stephen Ferranti, based on conceptual plan centered on a 1-mile bypass channel under Cropley Rd. which would eliminate the need to modify a greenbelt area with mature oaks, and eliminate bridgework at one to two bridges.
Benefits: **(economic, other)**	• Per Corps 2006 study, would address $500,000 in average annual damages, over $15 million in 1% damages (analysis using FEMA and local shallow flooding maps gives economic benefits of $1.3 M in average annual damages -- $50.4 M in 1% damages– calculated with FEMA's HAZUS damage calculation program in 2011.) • Improve stream habitat values and fisheries potential • Relieve property owners of the burden of paying for flood insurance.
Relation to Existing CSC 2000:	This project reach was originally part of the COE- SCVWD Clean, Safe Creeks 2000 project "Upper Berryessa." However, the Corps deleted the portion upstream of Highway 680 because the flow rate was too low to justify a federal interest. This proposed project would complete that upstream section with local-only funds.

Additional Notes:

This project completes construction on the uppermost section of the Upper Berryessa reach, upstream of Highway 680. Until 2009, this reach was included in the Clean, Safe Creeks Upper Berryessa Project, in partnership with the U. S. Army Corps of Engineers (COE). In 2009, the COE deleted this segment from the project ,because the COE could not justify work in a section of creek where the 1% flow was less than 800 cfs. Because it was part of the Clean, Safe Creeks 2000 program, this deleted segment has been included as a locally-funded project for the Safe, Clean Water 2012 program.

Goal 5: Natural Flood Protection Capital Projects

Element: Upper Llagas Creek

<table>
<tr><td>Safe, Clean Water Goal:</td><td>(5) Natural Flood Protection</td></tr>
<tr><td>Supports Goal(s):</td><td>2, 4</td></tr>
<tr><td>Activity Category:</td><td>5.2.0 NFP Capital</td></tr>
<tr><td>Element:</td><td>Upper Llagas Creek</td></tr>
<tr><td>Location:</td><td>Upper LLagas Creek, from Buena Vista Ave. to Wright Ave. including West Little Llagas Creek and East Little Llagas Creek
Morgan Hill, San Martin, Gilroy</td></tr>
<tr><td>Owner:</td><td>Liang Lee</td></tr>
<tr><td>Subject Matter Expert(s):</td><td>Bal Ganjoo</td></tr>
<tr><td>Element Goal:</td><td>This project continues a Clean, Safe Creeks 2000 project in partnership with the U. S. Army Corps of Engineers (COE) to plan, design, and construct improvements along 13.6 miles of channel extending from Buena Vista Ave. to Wright Ave., including West Little Llagas Creek.
This project will accomplish the following objectives:
Provide 1-percent flood capacity for 4 miles of channel in the urban Morgan Hill area, protecting 1,100 homes, 500 businesses, and 1,300 agricultural acres (according to CSC 2000 literature. Current estimates show 1,000 parcels in the associated floodplain that would benefit).
Improve stream habitat values and fisheries potential
Create additional wetlands
Improve stream water quality
Identify opportunities to integrate recreation improvements</td></tr>
<tr><td>Objectives/ Deliverables:</td><td>To provide 100-year flood protection to City of Morgan Hill;, to provide up to 10-year protection to the agricultural areas of Morgan Hill, Gilroy and un-incorporated areas of Santa Clara County in partnership with the federal government</td></tr>
<tr><td>Total Cost:</td><td>The project is currently authorized for a cost of $105million, with federal share of $65.0 million and a local share of $40.0 million.</td></tr>
<tr><td>Estimated Funding from SCW Program:</td><td>$8.6 M to fund Local Share
$0 to $77 M to fund Corps Share</td></tr>
<tr><td>Costs Based on:</td><td>If federal funds are not forthcoming the Clean Safe Creeks commitment to build parts of the project (Reach 7a and part of Reach 4) by 2016 would cost an approximately $15million for construction and buying land (based on Corps 2004 draft estimate).
The CSC Program allocated $17.3 million to the project. The finances to date are shown in the table below:
<table>
<tr><td>Allocation and expenditures</td><td></td></tr>
<tr><td>CSC 15-yr Funding Allocation</td><td>$ 17.3 M</td></tr>
<tr><td>State Subventions Reimbursements thru 2009</td><td>$ 2.4 M</td></tr>
<tr><td>Project Expenditures thru FY 2011</td><td><$ 9.7 M ></td></tr>
<tr><td>Estimated Cost to Progress Corps Project Work (Design and EIR/S)</td><td>< 9.7 M></td></tr>
<tr><td>City of Morgan Hill's Cost-Share</td><td>$ 3.0 M</td></tr>
<tr><td>Anticipated additional State Subventions Reimbursements</td><td>$ 2.0 M</td></tr>
</table></td></tr>
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<table>
<tr><td></td><td><table><tr><td>through FY12</td><td></td></tr><tr><td>Estimated Remaining Unallocated Funds</td><td>$ 5.3 M</td></tr></table>
Since 2000 the Corps has spend approximately $ 4.0 M on the planning and design of the project.</td></tr>
<tr><td>Benefits:
(economic, other)</td><td>Addresses $2.6 M in average annual damages -- $63.5 M in 1% damages for more than 1,500 parcels – calculated with FEMA's HAZUS damage calculation program in 2011.
Improve stream habitat values and fisheries potential
Improve trails and open space
Improve water quality
Relieve property owners of the burden of paying for flood insurance</td></tr>
<tr><td>Relation to Existing CSC 2000:</td><td>This project was funded under CSC 2000.
However, allocated CSC $s are insufficient to cover updated local share. Furthermore, the federal government has not budgeted sufficient $ for its share (estimated low by $77 million).</td></tr>
<tr><td colspan="2">Additional Notes:
Requires Congressional appropriations to fund design and construction of the project.
Currently not sufficiently funded either locally or federally - $8.6 million is estimated as the additional need to fulfill local funding share; $77 estimated need for federal share</td></tr>
</table>

Goal 5: Natural Flood Protection Capital Projects

Element: San Francisco Shoreline Feasibility Study

Safe, Clean Water Goal:	(5) Natural Flood Protection
Supports Goal(s):	4
Activity Category:	5.2.0 NFP Capital
Element:	SF Shoreline Study
Location:	The project is to evaluate and recommend tidal flood protection measures along the south San Francisco bay shoreline. The full project touches all South Bay cities that meet the SF Bay. The project is divided into staged Elements (?): (EIA-11) The first element is in the City of San Jose, focusing initially on a flood protection and ecosystem restoration project in the North San Jose/Alviso area. (Economic Impact Area 11) Future study elements in this project will include the remainder of the South Bay Shoreline in the cities of Sunnyvale, Mountain View, and Palo Alto. The project may or may not include the elements overlapping with the San Francisquito Creek watershed in Palo Alto.
Owner:	Chris Elias
Subject Matter Expert(s):	Al Gurevich
Element Goal:	Feasibility study for potential tidal flooding prevention projects.
Objectives/ Deliverables:	The District is partnering with the California State Coastal Conservancy, the U. S. Army Corps of Engineers, and working with stakeholders to produce a feasibility study for improvements to the San Francisco Bay Shoreline to accomplish the following objectives: • Provide and tidal flood protection to 760 parcels • Restore and enhance tidal marsh and related habitats • Provide recreational and public access opportunities throughout the tidal floodplain of Santa Clara County. Adapt to sea level rise
Total Cost:	**To be provided by Al with Melanie oversight.** Previous data: • Feasibility Study cost through FY2013 is 12.7M, per FY2011 CIP • For the Current (Alviso) Feasibility study, the study cost is $ 1.9M
Estimated Funding from SCW Program:	$5 M
Costs Based on:	Need more information
Benefits: **(economic, other)**	If feasible and approved, the project could provide flood protection to 760 parcels and reduce the potential for expanding the areas subject to tidal flooding due to sea level rise. In addition, the project would provide opportunities for additional trails and public access to tidal marshes.
Relation to Existing CSC 2000:	Not in the 2000 CSC program
Additional Notes: More information is needed on projected costs, schedules and what components could/should be funded through the Safe, Clean Water	

Appendix C2

Project Descriptions, Early Screening Versions, Spring 2011 - these projects may not have proceeded within selection process

Lower Peninsula/ West Valley Watershed

1. San Francisquito Creek, SF Bay to 101
2. San Francisquito Creek – 101 to Searsville Dam, Construction Phase
3. Stevens Creek from Highway 101 to Permanente Diversion
4. Stevens Creek, Highway 280 to Stevens Creek Dam
5. San Tomas Aquino Creek Flood Protection Project – SPRR to Williams Rd.
6. San Tomas Aquino Creek Flood Protection and Restoration Project – Williams Road to Westmont Debris Basin

Guadalupe Watershed

1. Canoas Creek – Guadalupe River to Cottle Road
2. Alamitos Creek – Planning, Design, Construction

Coyote Watershed

1. Upper Penitencia Creek – Coyote Creek to Dorel Drive Construction Phase
2. Mid-Coyote Creek Flood Protection Project (R6-R8b)
3. Mid-Coyote Creek Flood Protection Project (R9 – R14)
4. Calera Creek – Berryessa Creek to Upstream hwy 680
5. Quimby Creek – Thompson Creek to Murillo Avenue
6. South Babb Creek- Lower Silver Creek to Upstream of Clayton Road

Pajaro Watershed

1. Jones/ Alamias Creeks
2. West Branch Llagas Creek

Multiple Watersheds

1. San Francisco Bay Shoreline

PROJECT DESCRIPTION SAMPLE TEMPLATE	
San Francisquito Creek SF Bay to 101	
Project Number	10284008
Project Name	San Francisquito Creek Early Implementation
Project Contact	Bill Springer
Programs	Natural Flood Protection Water Resources Stewardship
Overall San Francisquito Project Description.	This project is sponsored by the San Francisquito Creek Joint Powers Authority (JPA),of which the District is a member agency, in partnership with the U.S. Army Corps of Engineers (COE)[1], to construct improvements along San Francisquito Creek from San Francisco Bay through Searsville Dam. There are two separate projects on different tracks at this time, one is upstream of Highway 101, and the other downstream of 101. Both projects are intended to meet the following objectives: • Provide 1-percent flood protection to 3260[2] parcels • Reduce bank erosion and sedimentation-related impacts along San Francisquito Creek • Avoid potential adverse impacts on fish and wildlife habitats • Minimize impacts to the creek's environmental resources and restore the riparian corridor where feasible
Early Implementation Project Location	• Palo Alto • Border between Palo Alto and East Palo Alto (San Mateo County) near San Francisquito Bay. • San Francisco Bay up to Highway 101. The replacement of the Highway 101 bridge will be done by Caltrans.
Early Implementation Project Components	Design and construct improvements downstream of Highway 101: • Marsh plain terrace creation • Levee lowering at Faber Tract • Floodwalls and levees
Project Start/Completion Dates	The Early Implementation Project is proceeding without COE funding, although it may be eligible at a later date for credit. Design is currently underway on the early implementation project. If funding can be secured through new special tax or a special financing district, construction could begin in CY 2012.
Capital Cost Estimate	Downstream 101 project: $20M-$25M
Implementation Issues	Permitting (Section 1601 streambed alteration agreements, COE 404, Regional Board 401 WQ Certification, BCDC, State Lands Commission?) Funding

[1] Early implementation does not include COE funding; Section 104 application pending, the District may get credit for this project under partnership funding for entire Bay to Searsville Dam project.
[2] The Downstream project protects 39 parcels in Palo Alto, the Santa Clara County side of the creek.

Project Precursors	Complete design documents for the project alternative #2. Identify and secure project funding.
Project Benefits	In addition to providing flood protection for 39 parcels in Palo Alto, the JPA aims to use its capital projects to provide new and improved habitats for endangered species in the creek's watershed and to provide enhanced recreational opportunities for the community. Other benefits include relieving property owners of the burden of paying for flood insurance.
Goals/Objectives Addressed	Goal 1: Natural Flood Protection Goal 2: Healthy Creeks and Bay Ecosystems Goal 3: Clean, Safe Water in Creeks and Bay Goal 4: Trails, Open Space, and Water Resource Management
Maintenance Activities	Maintenance of bank stabilization measures: • Conduct annual inspection of site. • Conduct repairs of bank stabilization measures, as needed. Vegetation Maintenance: • Conduct annual inspection of planted riparian vegetation. • Conduct maintenance of riparian vegetation by utilizing a combination of methods including hand removal, mechanical or chemical clearing. • Collect and dispose of vegetation debris.
Annual Maintenance Cost Estimate	Unknown
Notes	NGOs have expressed support for the removal of invasive, non-native plant species and for more restoration components.
References	San Francisquito Creek Flood Reduction Alternatives Analysis, Phillip Williams & Associates with H. T. Harvey and Associates, July 17, 2009

PROJECT DESCRIPTION SAMPLE TEMPLATE	
San Francisquito Creek-- 101 to Searsville Dam- Construction Phase	
Project Number	LP-1
Project Name	San Francisquito Creek, Construction Phase
Project Contact	Kevin Sibley
Programs	Natural Flood Protection Water Resources Stewardship
Overall Project Description	This project is sponsored by the San Francisquito Creek Joint Powers Authority (JPA),of which the District is a member agency, in partnership with the U.S. Army Corps of Engineers (COE)[1], to construct improvements along San Francisquito Creek from San Francisco Bay through Searsville Dam. There are two separate projects on different tracks, one is upstream of Highway 101, and the other downstream of 101. Both projects are intended to meet the following objectives: • Provide 1-percent flood protection to 3260 parcels • Reduce bank erosion and sedimentation-related impacts along San Francisquito Creek • Avoid potential adverse impacts on fish and wildlife habitats • Minimize impacts to the creek's environmental resources and restore the riparian corridor where feasible
Upstream 101 Project Location	• Palo Alto • Border between Palo Alto (Santa Clara County), and both East Palo Alto and Menlo Park (San Mateo County). • Upstream of Highway 101 through Searsville Dam. Most work will be between Highway 101 and Middlefield Road.
Upstream 101 Project Components	Upstream of Highway 101 Project • Bridge Replacements • Channel widening • Floodwalls
Project Start/Completion Dates	Still in Planning Phase. If funding can be secured through new special tax or a special financing district, construction could begin in FY 2018 .
Capital Cost Estimate	Upstream project: $88M-$106M
Implementation Issues	Permitting (Section 1601 streambed alteration agreements, COE 404, Regional Board 401 WQ Certification, BCDC), and Funding
Project Precursors	Complete planning and design documents for an approved project alternative Secure project funding
Project Benefits	In addition to providing flood protection, the JPA aims to use its capital projects to provide new and improved habitats for endangered species in the creek's watershed, and to provide enhanced recreational opportunities for the community. Other benefits include relieving

[1] Early implementation does not include COE funding; Section 104 application pending, the District may get credit for this project under partnership funding for entire Bay to Searsville Dam project.

	property owners of the burden of paying for flood insurance.
Goals/Objectives Addressed	Goal 1: Natural Flood Protection Goal 2: Healthy Creeks and Bay Ecosystems Goal 3: Clean, Safe Water Goal 4: Trails, Open Space, and Water Resource Management
Maintenance Activities	Maintenance of bank stabilization measures: • Conduct annual inspection of site. • Conduct repairs of bank stabilization measures, as needed. Vegetation Maintenance: • Conduct annual inspection of planted riparian vegetation. • Conduct maintenance of riparian vegetation by utilizing a combination of methods including hand removal, mechanical or chemical clearing. • Collect and dispose of vegetation debris.
Annual Maintenance Cost Estimate	Unknown
Notes	NGOs have expressed support for the removal of invasive, non-native plant species and for more restoration components.
References	San Francisquito Creek Flood Reduction Alternatives Analysis, Phillip Williams & Associates with H. T. Harvey and Associates, July 17, 2009

PROJECT DESCRIPTION	
Stevens Creek from Highway 101 to El Camino Real	
Project Number	LP-3
Project Name	Stevens Creek from Highway 101 to the Permanente Diversion Channel
Project Contact	Roger Narsim
Program	Natural Flood Protection Water Resources Stewardship Water Supply
Project Description	This project would:- • Use existing flood studies to design channel improvements for flood break out points between Hwy 101 and Evelyn Ave. • Conduct a flood study of Stevens Creek between Evelyn Ave and the Permanente Diversion Channel to determine flood break out locations. • Construct flood protection improvements at the areas determined above. • Remove fish barriers located in the project area. • Implement solutions to correct channel incision identified during recent Asset Management Surveys.
Project Location	• City of Mountain View and Sunnyvale • Stevens Creek between Highway 101 and the confluence with the Permanente Diversion Channel
Project Components	Install vortex rock weirs, spaced geomorphically, to restore bed grade sufficiently to stabilize eroding assets. Degraded reaches include Moffet to Middlefield, Evelyn to Highway 237, and upstream of El Camino to Highway 85. Replace outdated fish passage structure adjacent to Santa Clara County Vector Control site and correct priority one fish barrier(s). This reach may provide opportunities for stream restoration projects that satisfy mitigation/enhancement components of the 3 Creeks HCP.
Project Start/Completion Dates	Unknown
Capital Cost Estimate	Unknown
Implementation Issues	Permitting, possible right of way needs, multiple jurisdictions such as CalTrans and P.G.&E. , equipment access, Permanente Creek bypass flows.
Project Precursors	3 Creeks Habitat Conservation Plan negotiation.
Project Benefits	From a net present value analysis, it may be more economical to implement a reach-wide solution to channel incision than to individually address failing assets on Stevens Creek.
Goals/Objectives Addressed	Goal 1: Natural Flood Protection Goal 2: Healthy Creek and Bay Ecosystems Goal 3: Clean, Safe Water WS Objective: Protect, maintain and develop local water
Maintenance Activities	Facility condition assessments, sediment removal, vegetation

	management, fish ladder maintenance, graffiti eradication, trash and debris removal, bank stabilization. See maintenance guidelines from 1980 planning study for specific reach recommended maintenance practices.
Annual Maintenance Cost Estimate	Unknown
Notes	This project can be integrated with flood protection objectives, asset management programs, and 3 Creeks Habitat Conservation Plan
References	Waterways Asset Management Plan (AMP), Stevens Creek Evaluation, August 2010. Technical Memorandum – Additional Flood Mapping for Stevens Creek in Mountain View, CA, July 10th 2009 by Schaaf & Wheeler. Engineer's Report for the Stevens Creek Planning Study (Homestead Road to San Francisco Bay), June 1980.

PROJECT DESCRIPTION

Stevens Creek Highway 280 to Stevens Creek Dam

Project Number	LP-4
Project Name	Stevens Creek, Highway 280 to Stevens Creek Dam
Project Contact	Roger Narsim
Program	Natural Flood Protection Water Resources Stewardship
Project Description	This project plans, designs, and constructs flood protection on Stevens Creek from Highway 280 to Stevens Creek Dam. Improvements consistent with the approved project alternative will be designed to meet the following objectives: • Reduce depth of flooding to approximately 200 parcels during a 1-percent flood for Stevens Creek from Highway 280 to Stevens Creek Boulevard. • Identify opportunities for environmental mitigation/enhancement, such as stream restoration (to satisfy 3 Creeks HCP), trails, parks, and open space, for Board consideration. • Minimize impacts to environmental resources and provide opportunities to protect and enhance existing riparian habitat. • Provide maintenance guidelines for the Lower Peninsula Watershed Management Division. • 3.9 miles of Creek
Project Location	• City of Cupertino • Highway 280 to Stevens Creek Dam
Project Components	Possible addition of culvert at Highway 280 crossing. This reach may provide opportunities for stream restoration projects that satisfy mitigation/enhancement components of the 3 Creeks HCP. There may be opportunities for expanding the trail system.
Project Start/Completion Dates	Unknown
Capital Cost Estimate	Unknown
Implementation Issues	Coordination with CalTrans. Uncertain funding, permitting, right of way requirements. In 1974, community desires were for the park-like setting to remain as natural as possible. Therefore, flood protection measures upstream of Highway 280 are required to be non-structural.
Project Precursors	Feasibility study to determine the current owners' desires relative to flood protection.
Project Benefits	In addition to providing 1-percent flood protection to approximately 200 parcels, there are opportunities for environmental restoration/enhancements.
Goals/Objectives Addressed	Goal 1: Natural Flood Protection Goal 2: Healthy Creeks and Bay Ecosystems

	Goal 3: Clean, Safe Water Goal 4: Trails, Open Space, and Water Resource Management
Maintenance Activities	Vegetation management activities, downed tree and other obstruction removals, channel inspections.
Annual Maintenance Cost Estimate	Unknown
Notes	Need to research whether 22-foot culvert was added at Highway 280 to reduce flooding depths upstream of Highway 280 along Creston and Phar Lap Drives. Does not appear that the culvert was ever constructed.
References	Amended Planning Study for Stevens Creek Central Avenue, Mt. View, to Stevens Creek Dam, August 28, 1974

PROJECT DESCRIPTION	
San Tomas Aquino Creek Flood Protection Project – SPRR to Williams Rd.	
Project Number	WV-XX
Project Name	San Tomas Aquino Creek – SPRR to Williams Road
Project Contact	Roger Narsim
Program	Natural Flood Protection
Project Description	This project plans, designs, and constructs flood protection on San Tomas Aquino Creek from the Southern Pacific Railroad line to upstream of Williams Road. Improvements consistent with the approved project alternative will be designed to meet the following objectives: • Provide 1-percent flood protection for San Tomas Aquino Creek from the Southern Pacific Railroad line to upstream of Williams Road by removing approximately **4,800 (needs check)** parcels from the 1-percent floodplain. • 4.2 Miles of creek • Identify opportunities for environmental mitigation/enhancement, such as stream restoration, trails, parks, and open space, for Board consideration. • Provide maintenance guidelines for the West and Guadalupe Watersheds Division.
Project Location	• Cities of Santa Clara and San Jose • Southern Pacific Railroad (Caltrain) to Williams Road
Project Components	Addition of supplemental flood conveyance facilities. There may be opportunities for expanding the trail system along this reach.
Project Start/Completion Dates	Unknown
Capital Cost Estimate	Unknown
Implementation Issues	Coordination with Santa Clara County. Uncertain funding, permitting, right of way requirements.
Project Precursors	Feasibility Study, planning and design documents for an approved project alternative. Secure project funding.
Project Benefits	This project will provide 1% flood protection to approximately **4,800 (needs GIS check)** parcels. There will be opportunities for environmental restoration/enhancement along the creek in some sections of the project. San Tomas currently can convey approximately a 20-year flow.
Goals/Objectives Addressed	Goal 1: Reduced Potential for Flood Damages.
Maintenance Activities	Vegetation management, good neighbor maintenance, access road maintenance on some sections of this reach.
Annual Maintenance Cost Estimate	Unknown
Notes	

References	San Tomas Aquino Creek Planning Study Route 237 to Highway 101, August 1995. San Tomas Aquino/Saratoga Creek Planning Study Summary Report, January 1981.

PROJECT DESCRIPTION BLANK TEMPLATE	
San Tomas Aquino Creek Flood Protection and Restoration Project – Williams Road to Westmont Debris Basin	
Project Number	WV-1
Project Name	San Tomas Aquino Creek
Project Contact	Roger Narsim
Program	Natural Flood Protection Water Supply Watershed Stewardship
Project Description	This project would restore the concrete-lined section of San Tomas Aquino Creek along San Tomas Expressway from Williams Road to the Westmont Debris Basin at the confluence with Wildcat Creek. Project objectives include: • Restore the riparian corridor on San Tomas Aquino Creek to provide connectivity with the riparian corridor upstream of McCoy Avenue. • Remove the concrete lining along the channel to increase groundwater recharge. • Provide opportunities to expand the trail system on San Tomas Aquino Creek.
Project Location	• Cities of San Jose and Campbell • Williams Road to Westmont Debris Basin, 3.8 miles of Creek
Project Components	Removal of concrete lining from Williams Road to McCoy Avenue
Project Start/Completion Dates	Uncertain due to funding
Capital Cost Estimate	Unknown
Implementation Issues	• Within existing right of way and with a depressed maintenance road 5.5 feet above the channel invert, velocities would be nearly 10 ft/sec. • Redesign would require bank protection on left side looking upstream due to proximity of San Tomas Expressway. • Additional right of way would be costly and would require benefit/cost analysis to determine economic viability. • May require bridge modifications at several bridges and would require coordination with Santa Clara County Transportation Agency.
Project Precursors	Hydraulic modeling would be required to determine water surface elevations and future Level of Service criteria. Feasibility study would be required to determine right of way needs and economic analysis to determine whether benefits support project cost.
Project Benefits	Increased recharge potential Trails expansion Riparian corridor restoration
Goals/Objectives Addressed	Natural Flood Protection Water Supply

	Trails, Open Space and Water Resource Management
Maintenance Activities	Revegetation maintenance, access road maintenance, vegetation management, good neighbor maintenance
Annual Maintenance Cost Estimate	Uncertain
Notes	This project can be integrated with flood protection objectives, groundwater recharge, and riparian habitat objectives.
References	San Tomas Aquino Creek Planning Study Route 237 to Highway 101, August 1995 San Tomas Aquino/Saratoga Creek Planning Study Summary Report, January 1981

PROJECT DESCRIPTION	
Canoas Creek	
Project Number	GUAD-2
Project Name	Canoas Creek
Project Contact	Devin Mody
Programs	Natural Flood Protection
Project Description	This project plans, designs, and constructs flood protection on Canoas Creek from Nightingale Drive to Cottle Road. Improvements consistent with the approved project alternative will be designed to meet the following objectives: • Provide 1-percent flood protection for Canoas Creek from its confluence with the Guadalupe River upstream to Cottle Road to remove approximately 10,000 parcels from the 1-percent floodplain. • Identify opportunities for environmental enhancement, such as stream restoration, trails, parks, and open space, for Board consideration. • Minimize impacts to environmental resources and provide opportunities to protect and enhance existing riparian habitat. • Provide maintenance guidelines for the Guadalupe Watershed Management Division.
Project Location	Nightingale Drive to Cottle Road
Project Components	The recommended alternative is a 50-acre offsite detention pond, which will minimize the need to significantly modify the existing channel and the more than 15 bridges that cross it over the length of the project reach. Some floodwall improvements may be required. (Note: If the 50-acre site for a detention basin is the Lester property located near Capital Expressway, this component will not benefit the areas upstream of Capital Expressway which do not have 1-percent capacity.)
Project Start/Completion Dates	Uncertain due to funding issues. If funding can be secured: Planning will be completed within 3 years, Design in 3 years, and Construction in 4 years.
Capital Cost Estimate	Planning: $2.1 M Design: $52.0 M (Includes $50.0 M for right of way) Construction and Closeout: $17.5 M **Total: $71.6 M (2007)** Cost for unforeseen negotiations with utility owners is not included in the current estimated utility relocation cost. There is no federal interest for the project

Implementation Issues	• A funding source for the project has to be determined. • Design and coordination of utility and bridge relocations for each reach must be addressed and fully evaluated prior to the construction of the main channel improvements. • There is limited right of way along the project reach. Existing homes and development were constructed adjacent to existing creek. • The Guadalupe Watershed Integration Working Group will be the forum to discuss and resolve permit conditions for the project. • The Waterways Asset Management Plan has identified 15 conditions with a business risk exposure score of 40 or greater on Canoas Creek. The recommended management strategy for Canoas Creek is to implement a creek-wide solution to correct aging infrastructure deficiencies.
Project Precursors	Complete planning and design documents for an approved project alternative Identify and secure project funding
Project Benefits	This project will provide flood protection to approximately 10,000 parcels. Additionally, from a net present value analysis, it is more economical to implement a creek-wide solution to channel deficiencies than to individually address failing assets on Canoas Creek.
Goals/Objectives Addressed	Goal 1: Natural Flood Protection Goal 2: Reduced Potential for Flood Damages
Maintenance Activities	Sediment removal, vegetation management, erosion control, fence repairs, good neighborhood trash removal, facility condition assessments, access road maintenance, rodent control, and graffiti removal. See maintenance guidelines for specific maintenance history for all reaches of Canoas Creek.
Annual Maintenance Cost Estimate	Unknown
Notes	In March 1911, Canoas Creek overflowed, causing flooding along streets and residential areas of San Jose. In January 1982, floodwaters overflowed from Canoas Creek and caused minor flooding at Tillamook Drive. On January 9, 1995, Canoas Creek spilled over its banks at four locations: Redbird Drive, Kingfisher Drive, Calero Avenue, and Blossom Avenue; it also flooded a few homes along Nightingale Drive. Based on the October 1995 Report, Flood Protection in Santa Clara County Through 2010, potential damages that could occur from a 1-percent event for Canoas Creek, from Guadalupe River to Cottle Road, were estimated at $120M (1995 value).
References	PROJECT PROPOSAL: Canoas Creek Flood Protection Project, Ted Ibarra/Dennis Cheong, October 1, 2007 Canoas Creek Maintenance Guidelines, September 4, 2009

PROJECT DESCRIPTION	
Alamitos Creek – Planning, Design, Construction	
Project Number	Guad-1
Project Name	Alamitos Creek from Guadalupe River to Harry Road
Project Contact	None
Programs	Natural Flood Protection Water Resources Stewardship
Project Description	The scope of this project includes implementation of planning, design, and construction and closeout phases along Alamitos Creek from Guadalupe River to Harry Road. The proposed project is expected to meet the following objectives: • Provide 1-percent flood protection for Alamitos Creek from its confluence with the Guadalupe River upstream to Harry Road, for approximately 1,000 residential parcels. • Clarify which parcels are already protected from the 1-percent flood, which parcels will be obtain 1-percent protection by this project, and obtain a Letter of Map Revision (LOMR) from FEMA that reflects the current condition. • Identify opportunities for environmental enhancement, such as stream restoration, trails, parks, and open space, for Board consideration • Minimize impacts to environmental resources and provide opportunities to protect and enhance existing riparian habitat. • Provide maintenance guidelines for the Guadalupe Watershed Management Division.
Project Location	• City of San Jose • Alamitos Creek from Guadalupe River to Harry Road
Project Components	
Project Start/Completion Dates	Uncertain due to funding issues. If funding can be secured, planning will be completed in 3 years, Design in 2 years, and Construction in 3 years. Appropriate permits will be obtained during the project's design phase.
Capital Cost Estimate	Planning: $1.7 M Design: $21.4 M Construction and Closeout: $15.4 M **Total: $38.5 M (2007)**
Implementation Issues	Funding source for the project has to be determined. Design and coordination of utility and bridge relocations for each reach must be addressed and fully evaluated prior to the construction of the main channel improvements.

	Cost for unforeseen negotiations with utility owners is not included in the current estimated utility relocation cost. If the project limits are extended from Harry Road to Almaden Dam, the project will require 50 feet of ROW for 3 miles. There is no federal interest for the project. Up to 4 bridges may require replacement.
Project Precursors	Identify and secure project funding ? ?
Project Benefits	In addition to flood protection benefits: there are certain areas within the Alamitos Creek Watershed where FEMA still requires flood insurance. These areas appear to overlap with areas where the creek currently has 1-percent flood flow capacity. According to the latest data from the WWMM, there are remaining flood damages of $2.7M and 1045 homes and businesses in the Alamitos Creek 1-percent floodplain. Planning for this project will verify and define which areas do not meet the 1-percent capacity
Goals/Objectives Addressed	Goal 1: Natural Flood Protection Goal 2: Healthy Creeks and Bay Ecosystems Goal 4: Trails, Open Space, and Water Resource Management
Maintenance Activities	Not Identified
Annual Maintenance Cost Estimate	Unknown
Notes	There is no project at this time. The Project Proposal was written, but no follow-up was done. The Guadalupe Watershed Integration Working Group will be the forum to discuss and resolve permit conditions for the project. There is no federal interest for the project
References	PROJECT PROPOSAL: Alamitos Creek Flood Protection Project, Ted Ibarra/Dennis Cheong, September 28, 2007

PROJECT DESCRIPTION	
Upper Penitencia Creek- Coyote Creek to Dorel Drive Construction Phase	
Project Number	Coyote-1
Project Name	Upper Penitencia Creek- Construction Phase
Project Contact	Liang Lee
Programs	Natural Flood Protection Water Supply Watershed Stewardship
Project Description	This project partners with the U. S. Army Corps of Engineers (COE) to plan, design, and construct improvements along 4.2 miles of Upper Penitencia Creek from the confluence with Coyote Creek to Dorel Drive. This project will accomplish the following objectives: • Provide 1-percent flood protection to more than 5,000 homes, businesses, and public buildings • Mitigate for project impacts • Improve stream habitat values and fisheries potential • Reduce sedimentation and maintenance requirements • Improve water quality on Coyote Creek by preventing sediment deposits from forming a blockage at its confluence with Upper Penitencia Creek • Identify opportunities to integrate recreation improvements consistent with the City of San Jose's and Santa Clara County Park's Master Plan
Project Location	• San Jose • Confluence with Coyote Creek to Dorel Drive
Project Components	High-flow diversion channel (from King Road to Coyote Creek) to preserve the natural, low-flow channel. Open space/parkland to serve as a modified floodplain to preserve natural channel. Possible trail and park elements via collaborations with City of San Jose and Santa Clara County, consistent with Tri-Party agreement and City and County Park Master Plans. Possible sediment basins to reduce sediment load on Upper Penitencia Creek and through to Coyote Creek Possible modifications of existing water diversion structures to improve use of water rights and protect habitat.
Project Start/Completion Dates	Uncertain due to funding issues. With funding, construction could begin in FY 2020 by phasing, rather than waiting for sufficient funds for the entire project.
Capital Cost Estimate	The scope, schedule, costs and funding sources of the remaining design and construction phases will be determined at the completion of planning. Currently estimated at $66.5 to $92.5 M (2009)
Implementation Issues	Requires Congressional appropriations to fund the project. Currently not sufficiently funded either locally or federally.

Project Precursors	Completion of the Upper Penitencia Creek planning and partial design documents funded under Clean Safe Creeks and Natural Flood Protection Plan
Project Benefits	• 1-Percent flood protection for more than 5,000 homes, businesses, and public buildings • Improve stream habitat values and fisheries potential • Reduce sedimentation and maintenance requirements • Potential trails and open space opportunities • Improve water quality on Coyote Creek by addressing sediment blockages formed from Upper Penitencia Creek sediment load. • Provide updated maintenance guidelines and Operations and Maintenance Manual for Upper Penitencia Creek
Goals/Objectives Addressed	Goal 1: Natural Flood Protection Goal 2: Reduced Potential for Flood Damages Goal 3: Healthy Creeks and Bay Ecosystems Goal 4: Clean, Safe Water Goal 5: Trails, Open Space, and Water Resource Management
Maintenance Activities	Sediment removal, vegetation management, erosion control, fence repairs, good neighborhood trash removal, facility condition assessments, access road maintenance, rodent control, and graffiti removal.
Annual Maintenance Cost Estimate	Unknown
Notes	Flooding has occurred on Upper Penitencia Creek in each instance of severe flooding since district staff began preparing flood reports in 1967.
References	Waterways Asset Management Plan (AMP), Upper Penitencia Creek Evaluation, November, 2010 Upper Penitencia Creek Maintenance Guidelines 1967, 1978, 1980, 1982, 1983, 1986, 1995, 1996-97, and 1998 Flood Reports

PROJECT DESCRIPTION	
Mid-Coyote Creek Flood Protection Project	
Project Number	COY-2
Project Name	Mid-Coyote Creek Flood Protection Project: Reaches 4 through 8b
Project Contact	Zhen Shao
Programs	Natural Flood Protection Watershed Stewardship
Project Description	This project plans, designs, and constructs flood protection on Canoas Creek from Nightingale Drive to Cottle Road. Improvements consistent with the approved project alternative will be designed to meet the following objectives: • Plan and design measures to protect up to 1,400 parcels from 1 – percent flood event. • Identify opportunities to improve water quality within the project limits. • Identify potential environmental restoration and enhancement opportunities. • Identify potential re-vegetation and aesthetic elements. • Identify opportunities to provide for public recreation and access. • Minimize the need for future operations and maintenance activities and create a self-sustaining system within the completed project limits. • Obtain community support.
Project Location	Approximately 6.1 miles between Montague Expressway and I-280
Project Components	The recommended alternatives include the following options for additional study: 1. Floodwall with regular field maintenance; Floodwall only would be implemented in this alternative from reach 4 to 8b and Reaches between 9 and 14 would be left at existing condition. 2. Floodwall and creek widening; Creek banks would be raised by constructing a flood wall for reaches 4 and 5. From reach 6 to 8b, the creek would be widened within the potential 100' riparian corridor setback. The existing levee located on west bank of reaches 8a and 8b would be raised as well. 3. Creek enhancement options 4. Creek reprofiling: In this alternative, improvements within reaches 4 and 7 would be the same as Alternative 2. Starting at reach 8a, the creek invert would be reprofiled to 0.3% in slope. The creek would be widened on east bank in reach 8b and the west banks in reaches 8a and 8b would be raised to prevent flooding.

	5. Less than 100 year protection: A 25 – year flood event in the creek will be studied and flood protection measures will be identified for the reaches 4 through 14.
Project Start/Completion Dates	Uncertain due to funding issues. If funding can be secured: ????????????
Capital Cost Estimate	Construction and Closeout: **Total: $71.6 M (2007)**
Implementation Issues	
Project Precursors	
Project Benefits	
Goals/Objectives Addressed	Goal 1: Natural Flood Protection Goal 3: Healthy Creek and Bay Ecosystems Goal 4: Clean, Safe Water Goal 5: Trails and Open Space
Maintenance Activities	
Annual Maintenance Cost Estimate	
Notes	
References	EXECUTIVE SUMMARY: Mid Coyote. Not Dated

PROJECT DESCRIPTION	
Mid-Coyote Creek Flood Protection Project	
Project Number	COY-3
Project Name	Mid-Coyote Creek Flood Protection Project: Reaches 4 through 14
Project Contact	Zhen Shao
Programs	Natural Flood Protection Watershed Stewardship
Project Description	This project plans, designs, and constructs flood protection on Coyote Creek from Montague Expressway to Highway 280. Improvements consistent with the approved project alternative will be designed to meet the following objectives: • Plan and design measures to protect up to 1,400 parcels from 1 – percent flood event. • Identify opportunities to improve water quality within the project limits. • Identify potential environmental restoration and enhancement opportunities. • Identify potential re-vegetation and aesthetic elements. • Identify opportunities to provide for public recreation and access. • Minimize the need for future operations and maintenance activities and create a self-sustaining system within the completed project limits. • Obtain community support.
Project Location	(see table below)
Project Components	The recommended alternatives include the following options for additional study: 1. Floodwall with regular field maintenance: Floodwall only would be implemented in this alternative from reach 4 to 8b and Reaches between 9 and 14 would be left at existing condition. 2. Floodwall and creek widening: Creek banks would be raised by constructing a flood wall for reaches 4 and 5. From reach 6 to 8b, the creek would be widened within the potential 100' riparian corridor setback. The existing levee located on west bank of reaches 8a and 8b would be raised as well.

Project Location:

Reach	Begin Station	End Station	Length (FT)	Description
4	1+86	46+39	4,640	500' downstream from Montague Expressway to Charcot Avenue
5	46+39	64+42	1,800	Charcot Avenue to Highway 880
6	64+42	81+00	1,660	Highway 880 to Ridder Park Drive
7	81+00	98+01	1,700	Ridder Park Drive to Old Oakland Road
8	98+01	157+66	5,970	Old Oakland Road to Berryessa Road
9	157+66	182+68	2,500	Berryessa Road to Mabury Road
10	182+68	196+09	1,340	Mabury Road to Highway 101
11	196+09	232+11	6,300	Highway 101 to East Julian Street
12	232+11	255+53	2,340	East Julian Street to East Santa Clara Street
13	255+53	289+25	3,370	East Santa Clara Street to East William Street
14	289+25	319+69	3,040	East William Street to 500' upstream from Highway 280

	3. Creek enhancement options 4. Creek reprofiling: In this alternative, improvements within reaches 4 and 7 would be the same as Alternative 2. Starting at reach 8a, the creek invert would be reprofiled to 0.3% in slope. The creek would be widened on east bank in reach 8b and the west banks in reaches 8a and 8b would be raised to prevent flooding. 5. Less than 100 year protection: A 25 – year flood event in the creek will be studied and flood protection measures will be identified for the reaches 4 through 14.
Project Start/Completion Dates	Uncertain due to funding issues. If funding can be secured: ????????????
Capital Cost Estimate	Construction and Closeout: **Total: $71.6 M (2007)**
Implementation Issues	
Project Precursors	
Project Benefits	
Goals/Objectives Addressed	Goal 1: Natural Flood Protection Goal 3: Healthy Creek and Bay Ecosystems Goal 4: Clean, Safe Water Goal 5: Trails and Open Space
Maintenance Activities	
Annual Maintenance Cost Estimate	
Notes	
References	EXECUTIVE SUMMARY: Mid Coyote. Not Dated

PROJECT DESCRIPTION	
Mid-Coyote Creek Flood Protection Project	
Project Number	COY-2
Project Name	Mid-Coyote Creek Flood Protection Project: Reaches 6 through 14
Project Contact	Zhen Shao/Dennis Cheong
Programs	Natural Flood Protection Watershed Stewardship
Project Description	This project plans, designs, and constructs improvements along 4.9 miles of Coyote Creek from Highway 880 to Highway 280. Improvements consistent with the approved project alternative will be designed to meet the following objectives: • Plan and design measures to protect up to 1,400 parcels from 1 – percent flood event. • Identify opportunities to improve water quality within the project limits. • Identify potential environmental restoration and enhancement opportunities. • Identify potential re-vegetation and aesthetic elements. • Identify opportunities to provide for public recreation and access. • Minimize the need for future operations and maintenance activities and create a self-sustaining system within the completed project limits. • Obtain community support.
Project Location	Approximately 4.9 miles between Highway 880 and Highway 280
Project Components	The draft planning study funded by Clean Safe Creeks may recommend that by 2016, Reaches 4 and 5 will be designed and constructed to convey $Q_{1\%}$= 17,000 cfs. Reaches 6 to 8b will accommodate the 1-percent flow under existing conditions, 7,000 cfs. Alternatives have been developed for Reaches 6-14 for conveying the design 1-percent flow, but due to the cost (>$500M) and no foreseeable funding, final design and construction will be postponed past 2016 (subject to a Board decision). The alternatives under consideration can be found in the reference literature cited below.
Project Start/Completion Dates	Uncertain due to funding issues.
Capital Cost Estimate	Construction and Closeout: **Total: $550 M**
Implementation Issues	
Project Precursors	

Project Benefits	
Goals/Objectives Addressed	Goal 1: Natural Flood Protection Goal 3: Healthy Creek and Bay Ecosystems Goal 4: Clean, Safe Water Goal 5: Trails and Open Space
Maintenance Activities	
Annual Maintenance Cost Estimate	Uncertain
Notes	
References	EXECUTIVE SUMMARY: Mid Coyote. Not Dated Mid-Coyote CAR Planning Study Draft Conceptual Alternatives Report, September 2010

PROJECT DESCRIPTION	
Mid-Coyote Creek Flood Protection Project (R9-R14)	
Project Number	COY-2
Project Name	Mid-Coyote Creek Flood Protection Project: Reaches 9 through 14
Project Contact	Zhen Shao/Dennis Cheong
Programs	Natural Flood Protection Watershed Stewardship
Project Description	This project plans, designs, and constructs improvements along 3.1 miles of Coyote Creek from Berryessa Road to Interstate 280. Improvements consistent with the approved project alternative will be designed to meet the following objectives: • Planning and design improvements to protect up to 900 parcels from the 1-percent flood event. • Identify opportunities to improve water quality within the project limits. • Identify potential environmental restoration and enhancement opportunities. • Identify potential re-vegetation and aesthetic elements. • Identify opportunities to provide for public recreation and access. • Minimize the need for future operations and maintenance activities and create a self-sustaining system within the completed project limits.
Project Location	City of San Jose: Approximately 3.1 miles between Berryessa Road and Interstate 280
Project Components	Alternatives have been developed for Reaches 9-14 for conveying the design 1-percent flow, but due to the cost (>$500M), real estate constraints, and no foreseeable funding, final design and construction will be postponed past 2016 (subject to a Board decision). The alternatives under consideration can be found in the reference literature cited below.
Project Start/Completion Dates	Uncertain due to funding issues.
Capital Cost Estimate	Construction and Closeout: **Total:** **Greater than $500M**
Implementation Issues	
Project Precursors	
Project Benefits	
Goals/Objectives Addressed	Goal 1: Natural Flood Protection Goal 3: Healthy Creek and Bay Ecosystems Goal 4: Clean, Safe Water Goal 5: Trails and Open Space
Maintenance Activities	
Annual Maintenance Cost Estimate	Uncertain
Notes	This project is linked directly to the Coyote Creek Detention Basin Feasibility Study since it's impractical (because of real estate constraints) to provide flood protection to the Mid Coyote communities, so this project has also studied the feasibility of upstream detention and Anderson Reservoir modifications.
References	EXECUTIVE SUMMARY: Mid Coyote. Not Dated Mid-Coyote CAR Planning Study Draft Conceptual Alternatives Report, September 2010

Last Updated: 03/02/2011

PROJECT DESCRIPTION	
Coyote Creek Detention Basin Feasibility Study	
Project Number	Coyote-8
Project Name	Coyote Creek Detention Basin Feasibility Study
Project Contact	Liang Lee
Program	Natural Flood Protection Watershed Stewardship Water Supply
Project Description	This project would prepare in greater detail a feasibility study for the construction of off-stream detention/retention/storage facilities. The objective of this project is to reduce the 1-percent peak flow sufficiently to mitigate the flood breakout on Coyote Creek upstream of Silver Creek Valley Road and adjacent to Highway 101. The Mid-Coyote Project (Reaches 9 through 14) has studied the feasibility of upstream detention and Anderson Reservoir modifications. Based on this feasibility, upstream detention has been determined **not** to be a practical solution.
Project Location	Cities of San Jose, Morgan Hill: Base of Anderson Reservoir (southern boundary) downstream to Coyote Creek Golf Drive (northern boundary) approximately 7 miles in length.
Project Components	Will be based on results of Feasibility Study
Project Start/Completion Dates	Uncertain
Capital Cost Estimate	$700M to $1.0B
Implementation Issues	Will require negotiations with Santa Clara County. Possible ESA issues with excavation off-stream storage ponds. May require Anderson Reservoir reoperation plan. High implementation costs for relatively low reduction in flood damages.
Project Precursors	Complete groundwater study to determine depth to groundwater and maximum available volumes of off stream storage.
Project Benefits	If the 1-percent peak outflow from Anderson Dam can be reduced to match the capacity of Coyote Creek upstream of Silver Creek Road, approximately 5,144 parcels would be removed from the 1-percent floodplain (all shallow flooding)
Goals/Objectives Addressed	Goal 1: Natural Flood Protection Goal 2: Reduced Potential for Flood Damages Goal 3: Healthy Creek and Bay Ecosystems Goal 5: Trails, Open Space, and Water Resource Management
Maintenance Activities	Not Applicable
Annual Maintenance Cost Estimate	Unknown
Notes	1) The estimated project cost ($700M-1.0B) assumes purchasing all lands required to achieve the flood peak reduction. 2) This project is linked directly to the Mid-Coyote Project since it's impractical (because of real estate constraints) to provide flood protection to the Mid Coyote communities. The Mid-Coyote Project (Reaches 9 through 14) has studied the feasibility of upstream detention and Anderson Reservoir modifications. Assuming Anderson Reservoir filled to 90% capacity prior to 100-year storm, the available land adjacent to the Coyote

	Creek between Anderson Dam and Fisher Creek can provide approximately 14,314 acre-ft of detention storage, while the required volume was calculated as 18,500 acre-ft in the hydrology study. Based on this feasibility, upstream detention has been determined **not** to be a practical solution.
References	Adobe files for "34x44 280-Anderson sheet 4 proposed detention facility.pdf" and "34x44 280-Anderson sheet 3 proposed detention facility.pdf" Draft Mid Coyote Project Hydrology Alternatives Study, May 2007

Last Updated: 03/02/2011

PROJECT DESCRIPTION	
Calera Creek – Downstream Hwy 680	
Project Number	Coyote-4
Project Name	Calera Creek Downstream of Highway 680 (From Milpitas High School to Founders Lane)
Project Contact	Tony Ndah
Program	Natural Flood Protection
Project Description	This project plans, designs, and constructs flood protection on Calera Creek from the Milpitas High School to Founders Lane, near downstream of Highway 680. Improvements consistent with the approved project alternative will be designed to meet the following objectives: • Plan and design measures to protect up to 954 parcels (Total Parcel # to be verified) from 1 – percent flood event; • Identify potential environmental restoration and enhancement opportunities; • Identify potential re-vegetation and aesthetic elements. • Identify opportunities to provide for public recreation and access. • Minimize the need for future operations and maintenance activities and create a self-sustaining system within the completed project limits. • Provide maintenance guidelines for the Coyote Watershed Management Division.
Project Location	• City of Milpitas • From Milpitas High School to Founders Lane, near downstream of Highway 680. (Total length of the project is approximate 0.6 miles. Currently, downstream of this project , there is a project from confluence with Berryessa Creek to Milpitas High School is underway with fund available)
Project Components	The proposed project involves: • The construction of concrete flood walls, varying in height up to five feet, along the top of the District existing levees, from Milpitas High School to Founders Lane. • The project also involves construction improvements to the existing maintenance roads and emphasizes preservation of existing vegetation.
Project Start/Completion Dates	Uncertain due to funding
Capital Cost Estimate	Unknown
Implementation Issues	May require negotiations with Milpitas High School
Project Precursors	Possible partnership with the City of Milpitas. Would require entering into a cost-sharing agreement with the city.
Project Benefits	• Protects up to 954 parcels (Total# to be verified) from 1-percent

	flooding. • Improve access for long-term channel maintenance. • Incorporate opportunities to integrate levees with the City of Milpitas trail system and open space management.
Goals/Objectives Addressed	• Natural Flood Protection • Watershed Stewardship • Healthy Creeks and Bay Ecosystems • Trails, Open Space and Water Resource Management
Maintenance Activities	• Revegetation maintenance, access road maintenance, vegetation management, good neighbor maintenance, sediment removal
Annual Maintenance Cost Estimate	Unknown
Notes	The Lower Berryessa Project will address specific backwater and sea level rise effects near the confluence with Calera Creek. (This note may not applicable here since it is a project current underway with fund available)
References	Calera Creek Maintenance Guidelines

PROJECT DESCRIPTION BLANK TEMPLATE	
Calera Creek	
Project Number	Coyote-5
Project Name	Calera Creek Upstream of Highway 680 (From Founder Lane to Upstream of Highway 680 and further north to limit of jurisdiction)
Project Contact	Tony Ndah
Program	Natural Flood Protection
Project Description	This project plans, designs, and constructs flood protection on Calera Creek from Founder Lane to Upstream of Highway 680 and extended further more to limits of jurisdiction. Improvements consistent with the approved project alternative will be designed to meet the following objectives: • Plan and design measures to protect up to 421 parcels (Total # to be verified) from 1 – percent flood event; • Identify potential environmental restoration and enhancement opportunities; • Identify potential re-vegetation and aesthetic elements. • Identify opportunities to provide for public recreation and access. • Minimize the need for future operations and maintenance activities and create a self-sustaining system within the completed project limits. • Provide maintenance guidelines for the Coyote Watershed Management Division.
Project Location	• City of Milpitas • From Founder Lane to Upstream of Highway 680 and extended further north to limits of jurisdiction (Total length of this reach is approximate 3.8 miles, however, current information indicates that improvements limited to 0.6 miles between Founder Lane and Landon Drive).
Project Components	• Based on the FEMA flood maps, it appears that the existing 10'x8' RCB under Highway 680 may be insufficient to convey the 1-percent flow. (Further Hydraulic Analysis is deem necessary for this existing RCB, this may be a design and construction issue) • Proposed by- pass channel from Founder Lane to Highway 680 inside a 15-ft wide easement. • Proposed existing pedestrian bridge be replaced by a new bridge over the widened channel section. • The proposed construction from Founders Lane to I-680 involves the construction of a 6 ft by 5 ft buried box culvert within the Thomas Russell Middle School right of way. • North of Highway 680, between Park Victoria Drive and Landon Drive, most of the channel improvements about 2100 ft long would be outside of District right-of -way. A maintenance road parallel to west channel bank would be inside the District right-of

	way. • The project also involves construction improvements to the existing maintenance roads and emphasizes preservation of existing vegetation.
Project Start/Completion Dates	Uncertain due to funding
Capital Cost Estimate	Unknown
Implementation Issues	• May require negotiations and permits from CalTrans. • May require negotiations with Thomas Russell Middle School • May acquire right-of-way and easements.
Project Precursors	• Possible partnership with the City of Milpitas. Would require entering into a cost-sharing agreement with the city. • Need analysis of RCB conveyance capacity to confirm whether it is a restriction or not.
Project Benefits	• Protects up to 421 parcels from 1-percent flooding (Total # to be verified) • Prevents flooding and possible closure of Jacklin Road and Park Victoria Drive. • May provide an opportunity for providing a seasonal trail under Highway 680 similar to the trail at Upper Penitencia Creek under Highway 680. • Improve access for long-term channel maintenance. • Incorporate opportunities to integrate levees with the City of Milpitas trail system and open space management
Goals/Objectives Addressed	• Natural Flood Protection • Watershed Stewardship • Healthy Creeks and Bay Ecosystems • Trails, Open Space and Water Resource Management
Maintenance Activities	Uncertain
Annual Maintenance Cost Estimate	Unknown
Notes	There are several cul-de-sacs off Park Victoria Drive. Residents may be stranded until floodwaters subside.
References	FEMA flood maps Calera Creek Maintenance Guidelines, May 2005

PROJECT DESCRIPTION	
Quimby Creek – Thompson Creek to Murillo Avenue	
Project Number	Coyote-6
Project Name	Quimby Creek Flood Protection Project
Project Contact	Liang Lee
Program	Natural Flood Protection
Project Description	This project plans, designs, and constructs flood protection on Quimby Creek from Thompson Creek to the Limits of Jurisdiction. Improvements consistent with the approved project alternative will be designed to meet the following objectives: • Provide 1-percent flood protection for Quimby Creek from its confluence with Thompson Creek upstream to Murillo Avenue to remove approximately 3,438 parcels from the 1-percent floodplain. • Identify opportunities for environmental enhancement, such as stream restoration, trails, parks, and open space, for Board consideration. • Minimize impacts to environmental resources and provide opportunities to protect and enhance existing riparian habitat. Provide maintenance guidelines for the Coyote Watershed Management Division.
Project Location	• City of San Jose • Thompson Creek to Murillo Avenue, 1.9 miles of creek
Project Components	Unknown. Due to extensive development, may consider upstream detention ponds.
Project Start/Completion Dates	Uncertain due to funding
Capital Cost Estimate	Unknown
Implementation Issues	Area is heavily developed up to the foothills. The flood plain is completely shallow flooding less than one foot. Right of way needed for upstream detention may be difficult to acquire.
Project Precursors	None at this time.
Project Benefits	Protect 3,438 parcels from 1-percent flooding
Goals/Objectives Addressed	Goal 1: Natural Flood Protection Goal 2: Reduced Potential for Flood Damages Goal 5: Trails, Open Space and Water Resource Management
Maintenance Activities	Sediment removal, vegetation management, good neighbor maintenance.
Annual Maintenance Cost Estimate	Unknown
Notes	WWMM indicates existing capacity is a three-year event.
References	Maintenance Guidelines for Quimby Creek, May 2005

Last Updated: 02/15/2011

PROJECT DESCRIPTION	
South Babb Creek – Lower Silver Ck. to Upstream of Clayton Rd.	
Project Number	Coyote-7
Project Name	South Babb Creek Flood Protection Project
Project Contact	Liang Lee
Program	Natural Flood Protection
Project Description	This project plans, designs, and constructs flood protection on South Babb Creek from Lower Silver Creek to upstream of Clayton Road. Improvements consistent with the approved project alternative will be designed to meet the following objectives: • Provide 1-percent flood protection for South Babb Creek from its confluence with Lower Silver Creek to upstream of Clayton Road to remove approximately 1,494 parcels from the 1-percent floodplain. • 1.4 • Identify opportunities for environmental enhancement, such as stream restoration, trails, parks, and open space, for Board consideration. • Minimize impacts to environmental resources and provide opportunities to protect and enhance existing riparian habitat. • Provide maintenance guidelines for the Coyote & Pajaro Watershed Division.
Project Location	• City of San Jose • Lower Silver Creek to upstream of Clayton Road
Project Components	U-frame concrete channel
Project Start/Completion Dates	Uncertain due to funding
Capital Cost Estimate	Unknown
Implementation Issues	Public sentiment towards concrete channels
Project Precursors	Determine if the channel should be confined (box) or open. Determine project limit upstream of Clayton Road. Verify the number of parcels protected from the 1-percent flood.
Project Benefits	Protect 1,494 parcels form 1-percent flooding
Goals/Objectives Addressed	Natural Flood Protection Reduced Potential for Flood Damages Trails, Open Space and Water Resource Management
Maintenance Activities	Sediment removal, erosion control, vegetation management, good neighbor maintenance.
Annual Maintenance Cost Estimate	Unknown
Notes	WWMM indicates existing capacity is a three-year event. Channel bottom has eroded through to native ground in places. May be a

	candidate for rehabilitation under the asset management program.
References	South Babb Creek Maintenance Guidelines, May 2005

PROJECT DESCRIPTION	
Jones/Alamias Creeks	
Project Number	U/L-1
Project Name	Jones Alamias Flood Protection Project
Project Contact	Liang Lee/Scott Katric
Program	Natural Flood Protection
Project Description	This project plans, designs, and constructs flood protection improvements on Jones and Alamias Creeks from Leavesley Road to Bloomfield Avenue. Improvements consistent with the approved project alternative will be designed to meet the following objectives: • Provide 10-percent flood protection to surrounding rural area • Divert Alamias Creek into Llagas Creek south of Leavesley Road to reduce scope of work for Jones Creek • Acquire continuous maintenance easement right of way • Develop a stable channel to minimize maintenance costs • Reduce frequency of flooding from Jones and Alamias Creeks to approximately 219 parcels • Provide maintenance guidelines for the Uvas/Llagas Watershed Management Division
Project Location	City of Gilroy: Leavesley Road (northern boundary) to Bloomfield Avenue (southern boundary)
Project Components	Outfall structure at Llagas Creek south of Leavesley Road and excavated earth channels on Jones and Alamias Creeks
Project Start/Completion Dates	Uncertain due to funding
Capital Cost Estimate	Unknown
Implementation Issues	Coordination with property owners for right of way acquisition. Uncertainties regarding project acceptance by local community.
Project Precursors	May need Board policy that 10-percent flow is the design flow for streams in rural areas.
Project Benefits	Reduced potential for flood damages
Goals/Objectives Addressed	Goal 1: Natural Flood Protection
Maintenance Activities	Sediment removal, vegetation management, erosion control, access road maintenance
Annual Maintenance Cost Estimate	Unknown
Notes	If the Lower Llagas Creek project acquires the parcel south of Bloomfield, one possible solution is to reroute the discharge point into Llagas Creek at that property and let it confluence directly with the Pajaro River. A potential benefit of that option would be to create habitat for sensitive species.
References	Jones Creek Maintenance Guidelines

Last Updated: 03/02/2011

PROJECT DESCRIPTION	
West Branch Llagas Creek	
Project Number	U/L-1
Project Name	West Branch Llagas Creek Flood Protection Project
Project Contact	Liang Lee
Program	Natural Flood Protection
Project Description	This project plans, designs, and constructs flood protection improvements on West Branch Llagas Creeks from Highland Avenue to Day Road (See Note 1 below). Improvements consistent with the approved project alternative will be designed to meet the following objectives: • Provide 10-percent flood protection to surrounding rural area. (See Note 2 below) • Reduce frequency of flooding from West Branch Llagas Creek to approximately 174 parcels (Parcel # to be verified) • Provide maintenance guidelines for the Coyote/Pajaro Watershed Management Division
Project Location	• City of Morgan Hill and unincorporated areas • Upstream of Highland Avenue to Day Road (See Note 1 below)
Project Components	• Construct unlined trapezoidal earth channels • Consider bridge or box culvert modifications at street crossings: Fitzgerald Avenue, Highland Avenue and Santa Teresa Blvd. • Drainage outlets modification.
Project Start/Completion Dates	Uncertain due to funding
Capital Cost Estimate	Unknown
Implementation Issues	• Coordination with property owners for right of way acquisition. • Uncertainties regarding project acceptance by local community. (See Note 2 below)
Project Precursors	This project may need District Board Policy to allow a 10% flow in rural area is a permitted design flow.
Project Benefits	Reduced potential for flood damages
Goals/Objectives Addressed	• Natural Flood Protection • Watershed Stewardship
Maintenance Activities	Sediment removal, vegetation management, erosion control, access road maintenance
Annual Maintenance Cost Estimate	Unknown
Notes	1. The Project limit may need to be extended upstream of Santa Teresa Blvd if flooding occurs at that bridge culvert. (The project is measured from 500 ft upstream of Santa Teresa Blvd crossing to Day Road crossing. It is approximate 3.8 miles long.) 2. Need to consider whether or not a proposal that provides less than 10% flood protection is a better alternative.
References	1. West Branch Llagas Creek Maintenance Guidelines 2. Map and General Plan for West Branch Llagas Creek dated

	February 1998.

PROJECT DESCRIPTION TEMPLATE	
San Francisco Bay Shoreline	
Project Number	00044026
Project Name	San Francisco Bay Shoreline
Project Contact	Al Gurevich
Program	Natural Flood Protection
Project Description	The District is partnering with the California State Coastal Conservancy, the U. S. Army Corps of Engineers, and working with stakeholders to produce a feasibility study for improvements to the San Francisco Bay Shoreline to accomplish the following objectives: • Provide and tidal flood protection to 760 parcels • Restore and enhance tidal marsh and related habitats • Provide recreational and public access opportunities throughout the tidal floodplain of Santa Clara County. • Adapt to sea level rise
Project Location	• City of San Jose, the Study focuses initially on a reduced flood protection and ecosystem restoration project in the North San Jose/Alviso area. • Future study in this project will include the remainder of the South Bay Shoreline in the cities of Sunnyvale, Mountain View, and Palo Alto.
Project Components	This project consists of a feasibility study for potential tidal flooding prevention projects.
Project Start/Completion Dates	The project is currently funded for the planning phase only. The scope, schedule, costs and funding sources for the design phase and construction phase will be determined at the completion of the planning phase.
Capital Cost Estimate	Feasibility Study cost through FY2013 is 12.7M
Implementation Issues	Needs to be integrated with the South Bay Salt Pond Restoration Project to assure that flood protection measures work together with restoration measures. This is a feasibility study, so there isn't any building, so no permits.
Project Precursors	South Bay Salt Pond Restoration Plan. South Bay Salt Pond Restoration Project's Environmental Impact Statement/Environmental Impact Report indicates areas of possible coordination where salt pond levees are breeched to develop tidal marsh habitat.
Project Benefits	If feasible and approved, the project could provide flood protection to 760 parcels and reduce the potential for expanding the areas subject to tidal flooding due to sea level rise. In addition, the project would provide opportunities for additional trails and public access to tidal marshes.
Goals/Objectives Addressed	Goal 1: Natural Flood Protection Goal 2: Reduced Potential for Flood Damages Goal 3: Healthy Creeks and Bay Ecosystems

	Goal 5: Trails, Open Space, and Water Resource Management
Maintenance Activities	Levee inspection and maintenance activities; vegetation management activities; trash and debris removal
Annual Maintenance Cost Estimate	Unknown
Notes	SCVWD FY2012 Draft CIP p. IV-37-38
References	SCVWD Board of Directors Agenda Item 3/8/11: "South San Francisco Bay Shoreline Study Resumption of Work." Final Environmental Impact Statement/Environmental Impact Report for the South Bay Salt Pond Restoration Project, 2007

Appendix D

Economic Damage Modeling & 1% Floodplain Maps

HAZUS-MH model results for creek reaches studied, including maps of analyzed areas (alphabetical):

Alamitos
Berryessa (Upper)
Berryessa (Upper), upstream of 680
Calera
Coyote (Mid), Hwy I-880 to Berryessa Rd
Coyote (Mid), Montague to I-280
Crosley & Sierra Creeks
Guadalupe River (Upper)
Llagas (Upper)
Penitencia (Upper)
Permanente (Upper)
Ruby, Norwood, Quimby, & Fowler Creeks
San Francisquito, SF Bay to Middlefield Rd
San Francisquito, SF Bay to 101
San Tomas Aquino
Shoreline

HAZUS-MH: Flood Event Report

Region Name: Alamitos_FEMA

Flood Scenario: FEMA - 1_5 ft

Print Date: Tuesday, March 29, 2011

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 18 square miles and contains 384 census blocks. The region contains over 10 thousand households and has a total population of 28,370 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 9,586 buildings in the region with a total building replacement value (excluding contents) of 3,000 million dollars (2006 dollars). Approximately 93.52% of the buildings (and 91.52% of the building value) are associated with residential housing.

General Building Stock

HAZUS estimates that there are 9,586 buildings in the region which have an aggregate total replacement value of 3,000 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	2,745,350	91.5%
Commercial	193,442	6.4%
Industrial	27,641	0.9%
Agricultural	5,904	0.2%
Religion	16,276	0.5%
Government	481	0.0%
Education	10,585	0.4%
Total	**2,999,679**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	964,733	93.6%
Commercial	44,631	4.3%
Industrial	13,677	1.3%
Agricultural	2,529	0.2%
Religion	1,337	0.1%
Government	32	0.0%
Education	3,489	0.3%
Total	**1,030,428**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 9 schools, no fire stations, no police stations and no emergency operation centers.

Flood Scenario Parameters

HAZUS used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Alamitos_FEMA
Scenario Name:	FEMA - 1_5 ft
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Building Damage

General Building Stock Damage

HAZUS estimates that about 280 buildings will be at least moderately damaged. This is over 37% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS Flood technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	2	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	70	25.18	208	74.82	0	0.00	0	0.00	0	0.00
Total	**1**		**72**		**208**		**0**		**0**		**0**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	1	50.00	1	50.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	70	25.18	208	74.82	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	0	0	0	0
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	9	2	0	2

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 2,548 tons of debris will be generated. Of the total amount, Finishes comprises 100% of the total, Structure comprises 0% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 102 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 975 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 2,523 people (out of a total population of 28,370) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 51.31 million dollars, which represents 4.98 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 51.20 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 86.91% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	27.30	1.19	0.72	0.00	29.21
	Content	17.22	3.13	1.44	0.00	21.79
	Inventory	0.00	0.05	0.14	0.02	0.21
	Subtotal	**44.51**	**4.37**	**2.31**	**0.02**	**51.20**
Business Interruption						
	Income	0.00	0.01	0.00	0.00	0.01
	Relocation	0.08	0.00	0.00	0.00	0.08
	Rental Income	0.01	0.00	0.00	0.00	0.01
	Wage	0.00	0.01	0.00	0.01	0.02
	Subtotal	**0.08**	**0.01**	**0.00**	**0.01**	**0.11**
ALL	**Total**	**44.60**	**4.38**	**2.31**	**0.03**	**51.31**

Appendix A: County Listing for the Region

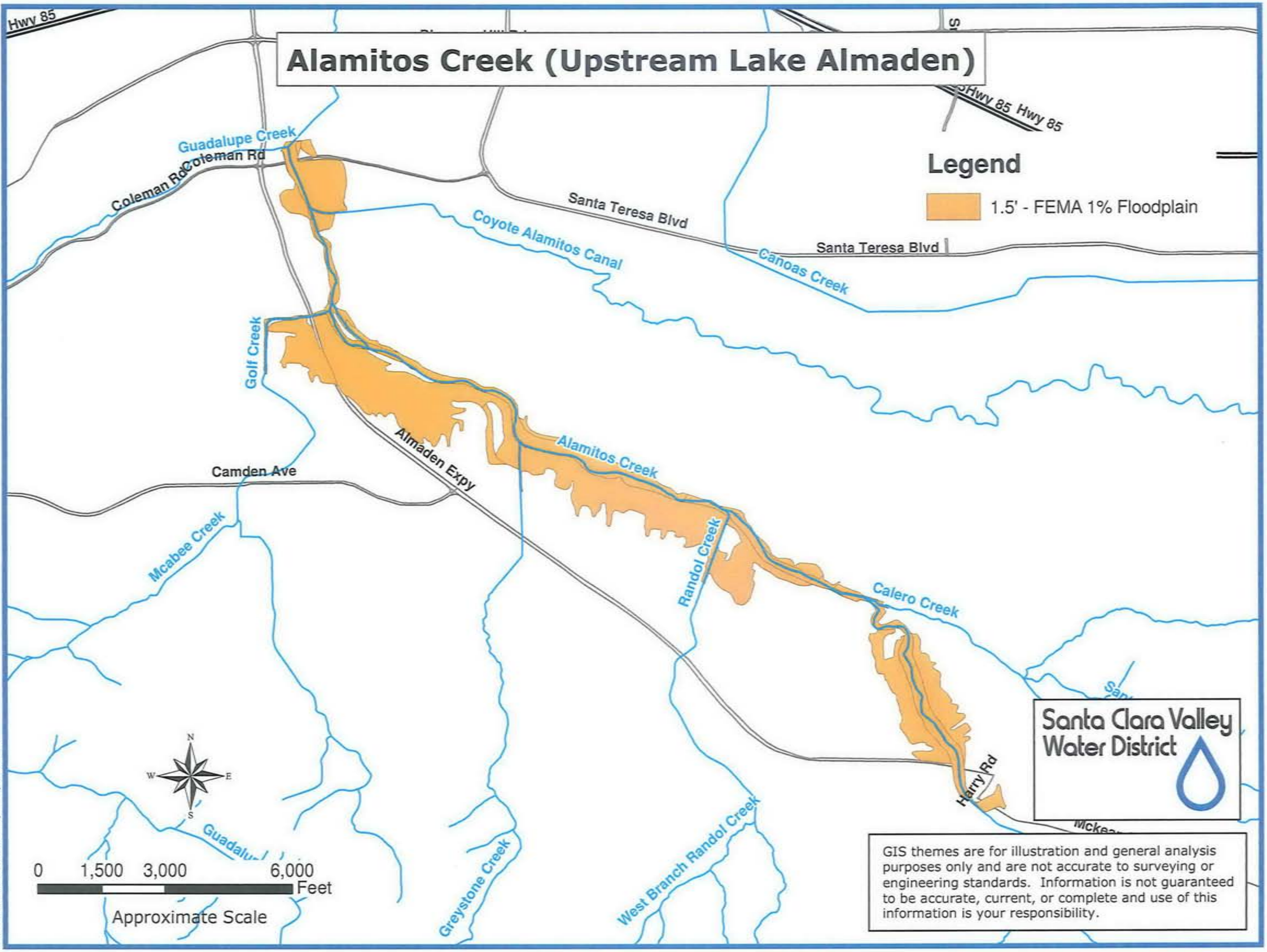
California

- Santa Clara

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
California				
Santa Clara	28,370	2,745,350	254,329	2,999,679
Total	**28,370**	**2,745,350**	**254,329**	**2,999,679**
Total Study Region	**28,370**	**2,745,350**	**254,329**	**2,999,679**

Alamitos Creek (Upstream Lake Almaden)



GIS themes are for illustration and general analysis purposes only and are not accurate to surveying or engineering standards. Information is not guaranteed to be accurate, current, or complete and use of this information is your responsibility.

Alamitos.mxd 9/20/2011

HAZUS-MH: Flood Event Report

Region Name: Berryessa Creek - Calaveras Blvd to I-680

Flood Scenario: User Depth Grid - 1 ft

Print Date: Tuesday, March 15, 2011

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 8 square miles and contains 387 census blocks. The region contains over 12 thousand households and has a total population of 40,908 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 10,579 buildings in the region with a total building replacement value (excluding contents) of 4,212 million dollars (2006 dollars). Approximately 88.66% of the buildings (and 63.00% of the building value) are associated with residential housing.

General Building Stock

HAZUS estimates that there are 10,579 buildings in the region which have an aggregate total replacement value of 4,212 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	2,653,266	63.0%
Commercial	890,233	21.1%
Industrial	604,867	14.4%
Agricultural	3,020	0.1%
Religion	36,300	0.9%
Government	8,036	0.2%
Education	15,778	0.4%
Total	**4,211,500**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	565,774	42.3%
Commercial	438,181	32.8%
Industrial	298,066	22.3%
Agricultural	1,325	0.1%
Religion	19,154	1.4%
Government	6,682	0.5%
Education	6,993	0.5%
Total	**1,336,175**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 9 schools, 1 fire station, no police stations and no emergency operation centers.

Flood Scenario Parameters

HAZUS used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Berryessa Creek - Calaveras Blvd to I-680
Scenario Name:	User Depth Grid - 1 ft
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

General Building Stock Damage

HAZUS estimates that about 330 buildings will be at least moderately damaged. This is over 42% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS Flood technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	25	65.79	13	34.21	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	6	66.67	1	11.11	2	22.22	0	0.00	0	0.00	0	0.00
Religion	3	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	6	1.88	77	24.06	237	74.06	0	0.00	0	0.00	0	0.00
Total	**41**		**91**		**239**		**0**		**0**		**0**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	12	85.71	2	14.29	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	8	88.89	1	11.11	0	0.00	0	0.00	0	0.00	0	0.00
Steel	6	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	7	2.15	81	24.92	237	72.92	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	1	0	0	0
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	9	3	0	3

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 1,783 tons of debris will be generated. Of the total amount, Finishes comprises 100% of the total, Structure comprises 0% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 71 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 1,305 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 3,716 people (out of a total population of 40,908) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 118.95 million dollars, which represents 8.90 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 117.41 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 27.86% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

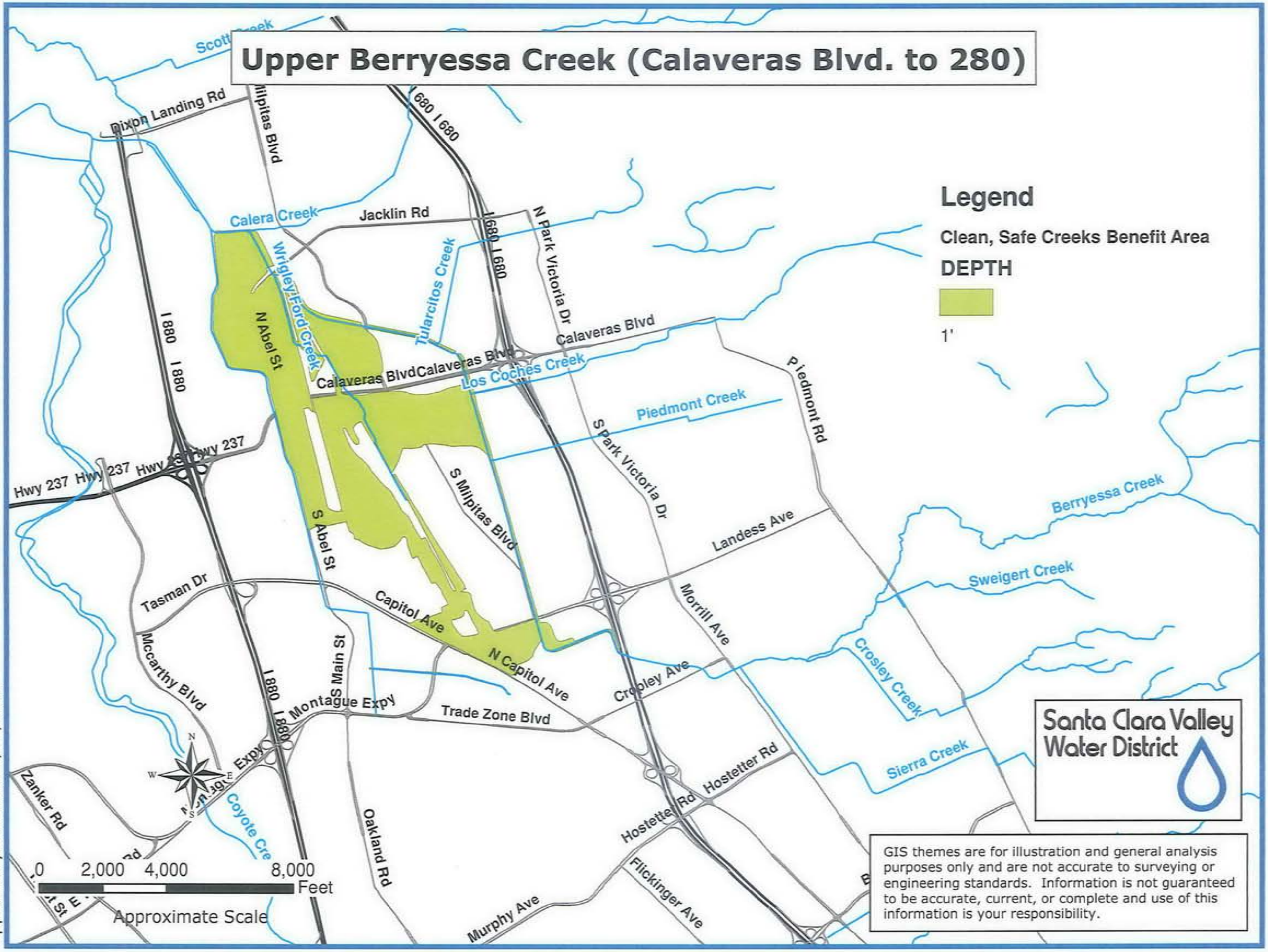
Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	20.91	13.78	8.07	0.44	43.20
	Content	12.13	41.94	15.90	0.97	70.94
	Inventory	0.00	1.03	2.22	0.01	3.26
	Subtotal	**33.04**	**56.75**	**26.19**	**1.43**	**117.41**
Business Interruption						
	Income	0.00	0.30	0.01	0.01	0.31
	Relocation	0.08	0.07	0.01	0.00	0.16
	Rental Income	0.02	0.04	0.00	0.00	0.06
	Wage	0.00	0.33	0.01	0.68	1.02
	Subtotal	**0.10**	**0.74**	**0.02**	**0.69**	**1.55**
ALL	**Total**	**33.14**	**57.49**	**26.21**	**2.11**	**118.95**

Appendix A: County Listing for the Region

California
- Santa Clara

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
California				
Santa Clara	40,908	2,653,266	1,558,234	4,211,500
Total	**40,908**	**2,653,266**	**1,558,234**	**4,211,500**
Total Study Region	**40,908**	**2,653,266**	**1,558,234**	**4,211,500**



UpperBerryessa.mxd 9/21/2011

HAZUS-MH: Flood Event Report

Region Name: Upper Berryessa, upstream I-680

Flood Scenario: User Depth Grid

Print Date: Wednesday, July 06, 2011

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 18 square miles and contains 513 census blocks. The region contains over 14 thousand households and has a total population of 50,838 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 13,069 buildings in the region with a total building replacement value (excluding contents) of 4,723 million dollars (2006 dollars). Approximately 90.59% of the buildings (and 71.89% of the building value) are associated with residential housing.

General Building Stock

HAZUS estimates that there are 13,069 buildings in the region which have an aggregate total replacement value of 4,723 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	3,395,579	71.9%
Commercial	729,241	15.4%
Industrial	519,765	11.0%
Agricultural	4,268	0.1%
Religion	43,300	0.9%
Government	6,205	0.1%
Education	24,705	0.5%
Total	**4,723,063**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	918,565	89.9%
Commercial	79,992	7.8%
Industrial	12,040	1.2%
Agricultural	757	0.1%
Religion	5,034	0.5%
Government	943	0.1%
Education	3,944	0.4%
Total	**1,021,275**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 16 schools, 2 fire stations, no police stations and no emergency operation centers.

Flood Scenario Parameters

HAZUS used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Upper Berryessa, upstream I-680
Scenario Name:	User Depth Grid
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

General Building Stock Damage

HAZUS estimates that about 394 buildings will be at least moderately damaged. This is over 37% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS Flood technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	5	1.25	88	22.06	306	76.69	0	0.00	0	0.00	0	0.00
Total	**5**		**88**		**306**		**0**		**0**		**0**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	5	1.25	88	22.06	306	76.69	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	2	0	0	0
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	16	1	0	1

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 3,738 tons of debris will be generated. Of the total amount, Finishes comprises 100% of the total, Structure comprises 0% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 150 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 1,662 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 4,628 people (out of a total population of 50,838) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 50.40 million dollars, which represents 4.94 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 50.24 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 89.76% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	28.96	1.07	0.18	0.01	30.22
	Content	16.17	3.45	0.22	0.07	19.90
	Inventory	0.00	0.07	0.04	0.00	0.11
	Subtotal	**45.13**	**4.58**	**0.44**	**0.08**	**50.24**
Business Interruption						
	Income	0.00	0.01	0.00	0.01	0.01
	Relocation	0.10	0.00	0.00	0.00	0.10
	Rental Income	0.01	0.00	0.00	0.00	0.01
	Wage	0.00	0.01	0.00	0.03	0.04
	Subtotal	**0.11**	**0.02**	**0.00**	**0.03**	**0.17**
ALL	**Total**	**45.24**	**4.60**	**0.44**	**0.11**	**50.40**

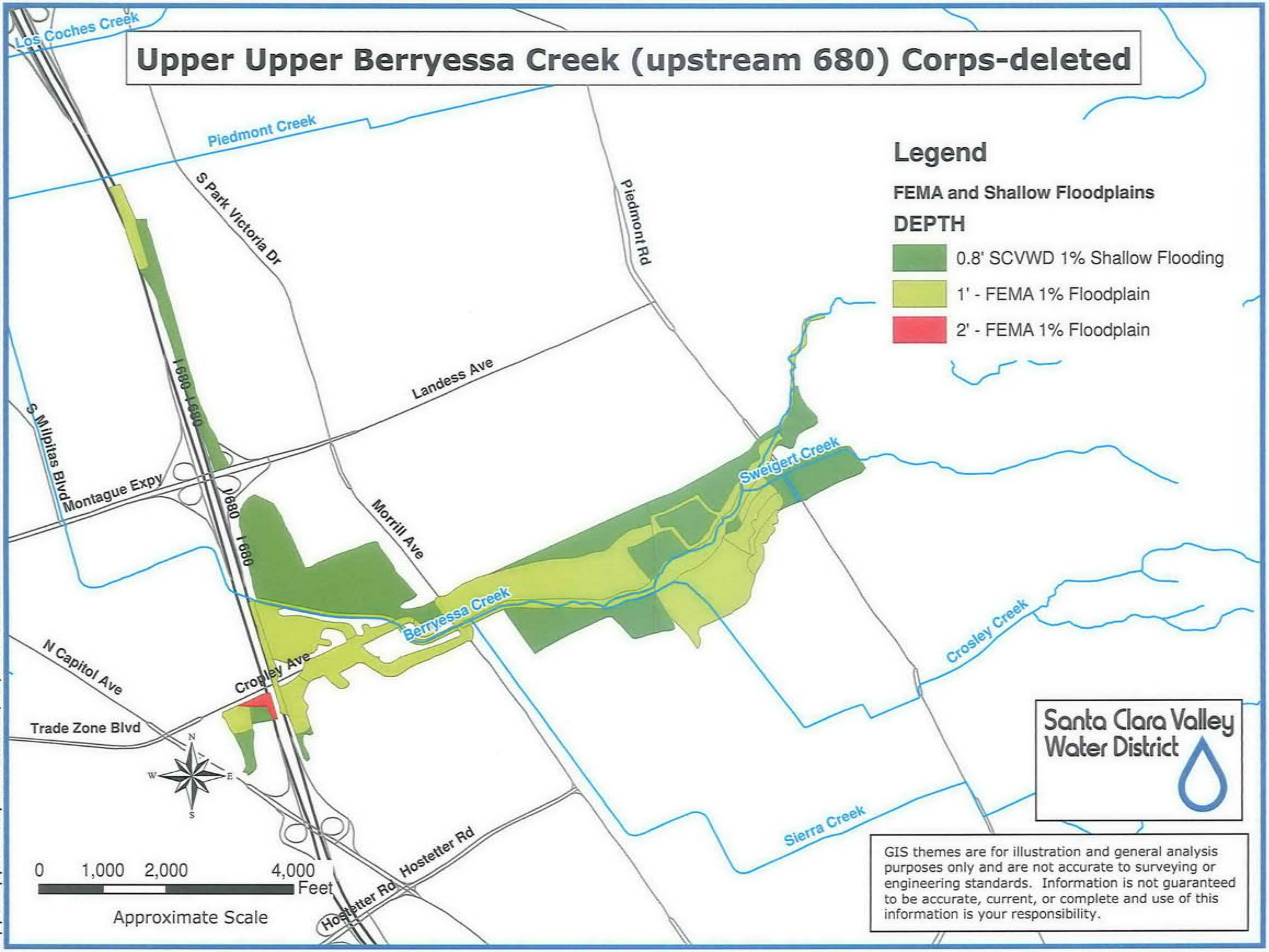
Appendix A: County Listing for the Region

California

- Santa Clara

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars) Residential	Non-Residential	Total
California				
Santa Clara	50,838	3,395,579	1,327,484	4,723,063
Total	**50,838**	**3,395,579**	**1,327,484**	**4,723,063**
Total Study Region	**50,838**	**3,395,579**	**1,327,484**	**4,723,063**



UpperUpperBerryessa.mxd 9/20/2011

HAZUS-MH: Flood Event Report

Region Name: Calera

Flood Scenario: User Depth Grid - FEMA and shallow

Print Date: Wednesday, April 06, 2011

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 8 square miles and contains 171 census blocks. The region contains over 5 thousand households and has a total population of 16,577 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 4,997 buildings in the region with a total building replacement value (excluding contents) of 1,611 million dollars (2006 dollars). Approximately 93.68% of the buildings (and 91.72% of the building value) are associated with residential housing.

General Building Stock

HAZUS estimates that there are 4,997 buildings in the region which have an aggregate total replacement value of 1,611 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,477,464	91.7%
Commercial	101,641	6.3%
Industrial	16,210	1.0%
Agricultural	663	0.0%
Religion	5,716	0.4%
Government	3,877	0.2%
Education	5,247	0.3%
Total	**1,610,818**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	658,999	93.2%
Commercial	37,162	5.3%
Industrial	3,160	0.4%
Agricultural	80	0.0%
Religion	3,133	0.4%
Government	0	0.0%
Education	4,501	0.6%
Total	**707,035**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 6 schools, no fire stations, 1 police station and no emergency operation centers.

Flood Scenario Parameters

HAZUS used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Calera
Scenario Name:	User Depth Grid - FEMA and shallow
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

General Building Stock Damage

HAZUS estimates that about 314 buildings will be at least moderately damaged. This is over 39% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS Flood technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	2	0.63	80	25.32	234	74.05	0	0.00	0	0.00	0	0.00
Total	**2**		**80**		**234**		**0**		**0**		**0**	

Table 4: Expected Building Damage by Building Type

	1-10		11-20		21-30		31-40		41-50		Substantially	
Building Type	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	2	0.63	80	25.32	234	74.05	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	0	0	0	0
Hospitals	0	0	0	0
Police Stations	1	0	0	0
Schools	6	1	0	1

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 1,306 tons of debris will be generated. Of the total amount, Finishes comprises 100% of the total, Structure comprises 0% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 52 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 1,172 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 3,355 people (out of a total population of 16,577) will seek temporary shelter in public shelters.

The total economic loss estimated for the flood is 89.31 million dollars, which represents 6.32 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 44.52 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 90.31% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	24.97	0.87	0.23	0.00	26.08
	Content	15.26	2.74	0.37	0.00	18.38
	Inventory	0.00	0.02	0.05	0.00	0.07
	Subtotal	**40.24**	**3.63**	**0.66**	**0.00**	**44.52**
Business Interruption						
	Income	0.00	0.01	0.00	0.00	0.01
	Relocation	0.08	0.00	0.00	0.00	0.08
	Rental Income	0.01	0.00	0.00	0.00	0.01
	Wage	0.00	0.01	0.00	0.02	0.03
	Subtotal	**0.09**	**0.02**	**0.00**	**0.02**	**0.13**
ALL	**Total**	**40.33**	**3.64**	**0.66**	**0.02**	**44.65**

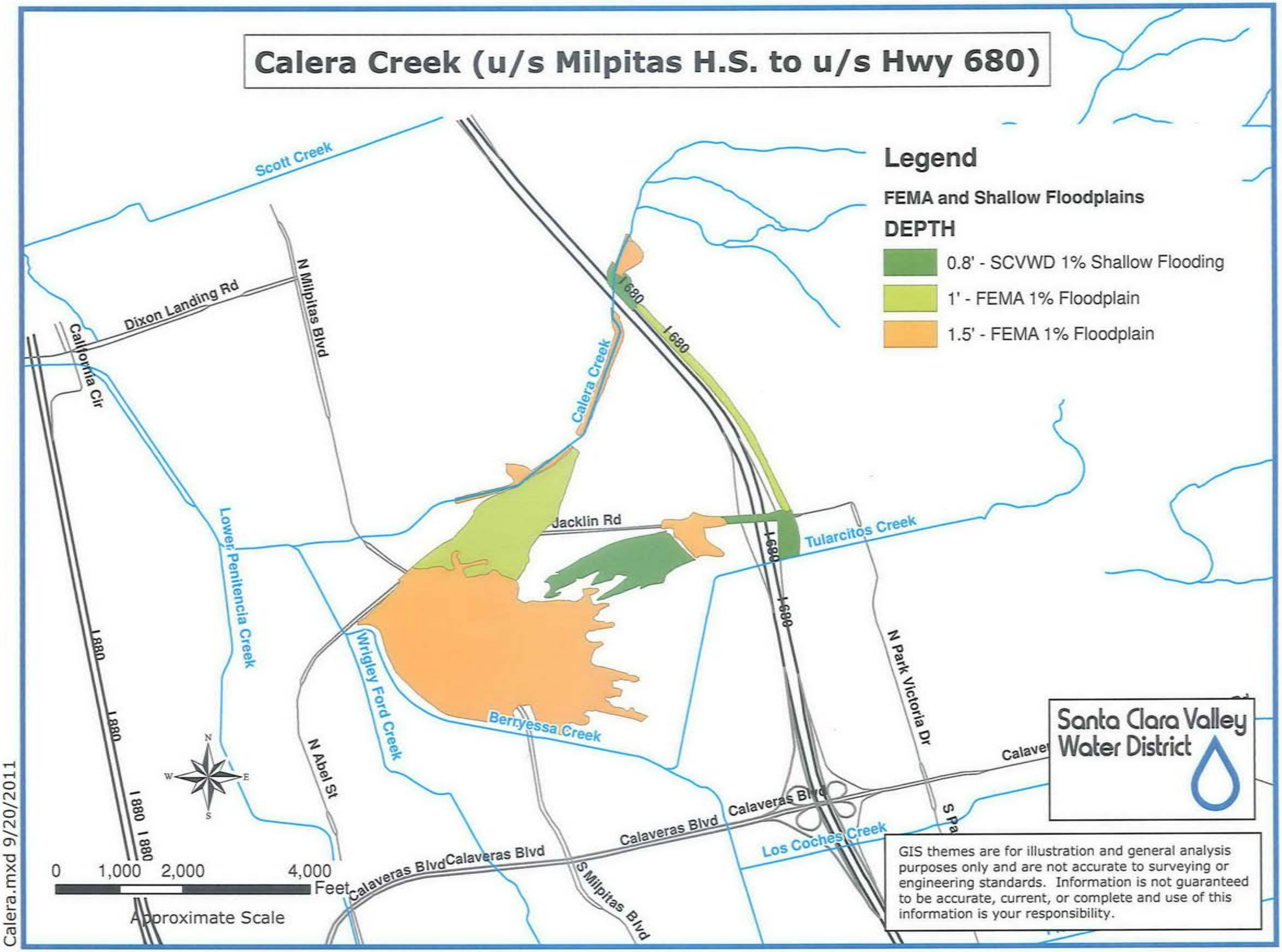
Appendix A: County Listing for the Region

California

- Santa Clara

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
California				
Santa Clara	16,577	1,477,464	133,354	1,610,818
Total	**16,577**	**1,477,464**	**133,354**	**1,610,818**
Total Study Region	**16,577**	**1,477,464**	**133,354**	**1,610,818**


Calera Creek (u/s Milpitas H.S. to u/s Hwy 680)
Legend
FEMA and Shallow Floodplains
DEPTH
0.8' - SCVWD 1% Shallow Flooding
1' - FEMA 1% Floodplain
1.5' - FEMA 1% Floodplain
Scott Creek
Dixon Landing Rd
N Milpitas Blvd
California Cir
Calera Creek
I 680
Jacklin Rd
Tularcitos Creek
Lower Penitencia Creek
Wrigley Ford Creek
Berryessa Creek
N Abel St
N Park Victoria Dr
I 880
Calaveras Blvd
S Milpitas Blvd
Los Coches Creek
N
S
W
E
0 1,000 2,000 4,000
Feet
Approximate Scale
Santa Clara Valley Water District
GIS themes are for illustration and general analysis purposes only and are not accurate to surveying or engineering standards. Information is not guaranteed to be accurate, current, or complete and use of this information is your responsibility.
Calera.mxd 9/20/2011

HAZUS-MH: Flood Event Report

Region Name: Coyote - all

Flood Scenario: User Depth Grid

Print Date: Wednesday, May 11, 2011

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 14 square miles and contains 753 census blocks. The region contains over 24 thousand households and has a total population of 82,901 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 19,666 buildings in the region with a total building replacement value (excluding contents) of 7,460 million dollars (2006 dollars). Approximately 88.48% of the buildings (and 60.67% of the building value) are associated with residential housing.

General Building Stock Damage

HAZUS estimates that about 701 buildings will be at least moderately damaged. This is over 30% of the total number of buildings in the scenario. There are an estimated 192 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS Flood technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	23	71.88	9	28.13	0	0.00	0	0.00	0	0.00	0	0.00
Education	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	3	30.00	7	70.00	0	0.00	0	0.00	0	0.00
Religion	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	1	0.15	136	19.91	354	51.83	0	0.00	0	0.00	192	28.11
Total	**27**		**148**		**361**		**0**		**0**		**192**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	5	62.50	3	37.50	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	192	100.00
Masonry	8	88.89	1	11.11	0	0.00	0	0.00	0	0.00	0	0.00
Steel	5	71.43	2	28.57	0	0.00	0	0.00	0	0.00	0	0.00
Wood	1	0.20	136	27.70	354	72.10	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 175 hospital beds available for use. On the day of the scenario flood event, the model estimates that 175 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	0	0	0	0
Hospitals	1	0	0	0
Police Stations	0	0	0	0
Schools	20	3	0	3

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 10,811 tons of debris will be generated. Of the total amount, Finishes comprises 59% of the total, Structure comprises 12% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 432 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 3,548 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 10,264 people (out of a total population of 82,901) will seek temporary shelter in public shelters.

The total economic loss estimated for the flood is 150.18 million dollars, which represents 10.03 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 148.81 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 44.65% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	39.90	11.76	8.47	0.07	60.19
	Content	26.98	40.13	17.71	0.23	85.04
	Inventory	0.00	0.66	2.86	0.07	3.58
	Subtotal	**66.87**	**52.54**	**29.03**	**0.36**	**148.81**
Business Interruption						
	Income	0.00	0.24	0.00	0.07	0.31
	Relocation	0.16	0.03	0.00	0.00	0.19
	Rental Income	0.02	0.02	0.00	0.00	0.04
	Wage	0.01	0.26	0.00	0.56	0.83
	Subtotal	**0.19**	**0.55**	**0.01**	**0.64**	**1.38**
ALL	**Total**	**67.06**	**53.09**	**29.04**	**1.00**	**150.18**

Appendix A: County Listing for the Region

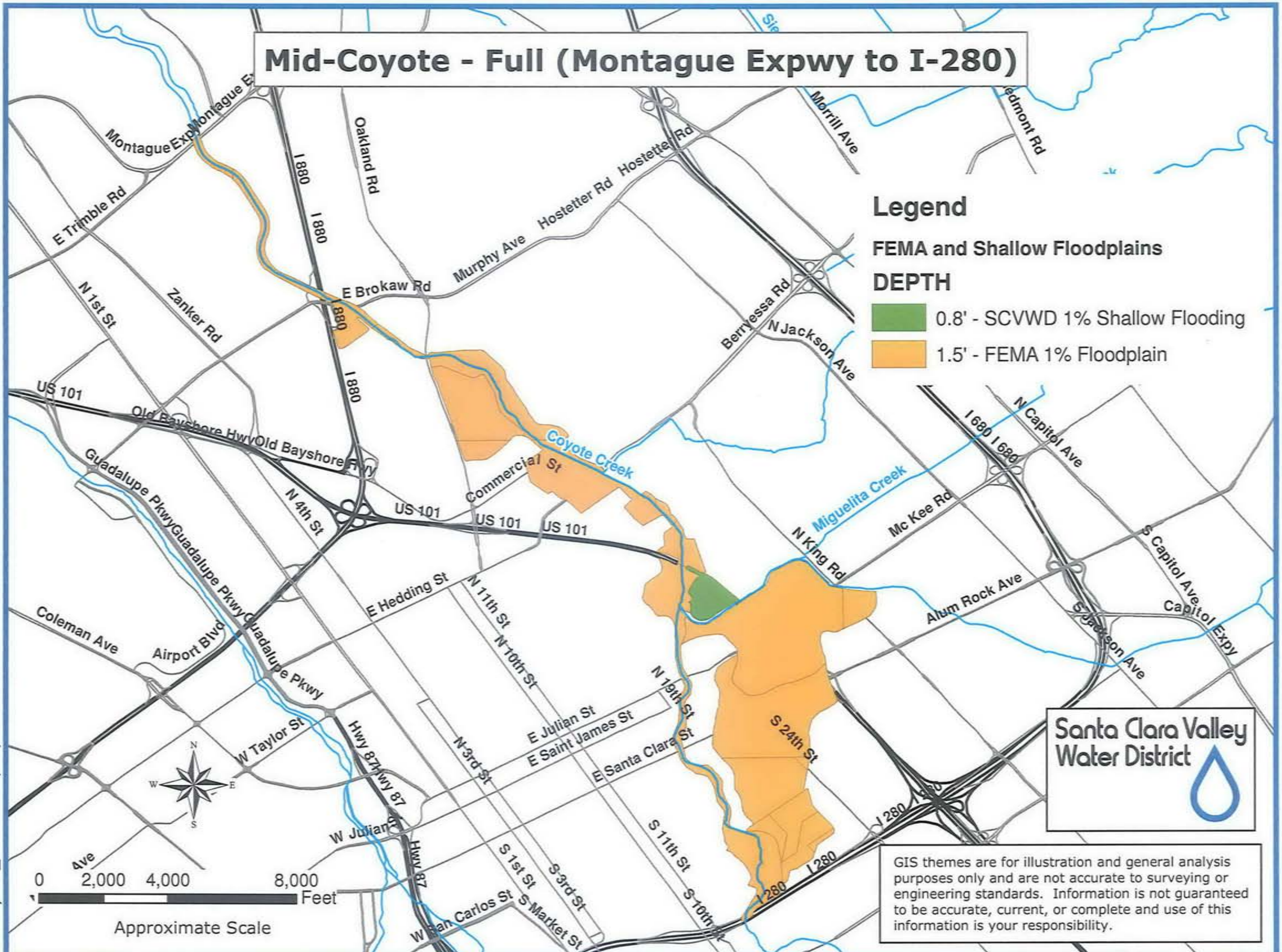
California

- Santa Clara

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
California				
Santa Clara	82,901	4,526,032	2,934,215	7,460,247
Total	**82,901**	**4,526,032**	**2,934,215**	**7,460,247**
Total Study Region	**82,901**	**4,526,032**	**2,934,215**	**7,460,247**

Mid-Coyote - Full (Montague Expwy to I-280)



Legend

FEMA and Shallow Floodplains

DEPTH

- 0.8' - SCVWD 1% Shallow Flooding
- 1.5' - FEMA 1% Floodplain

Santa Clara Valley Water District

GIS themes are for illustration and general analysis purposes only and are not accurate to surveying or engineering standards. Information is not guaranteed to be accurate, current, or complete and use of this information is your responsibility.

MidCoyote_full.mxd 9/21/2011

HAZUS-MH: Flood Event Report

Region Name: Coyote - 6 to 8b

Flood Scenario: User Depth Grid

Print Date: Wednesday, May 11, 2011

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 3 square miles and contains 222 census blocks. The region contains over 5 thousand households and has a total population of 16,954 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 5,444 buildings in the region with a total building replacement value (excluding contents) of 1,738 million dollars (2006 dollars). Approximately 91.59% of the buildings (and 68.61% of the building value) are associated with residential housing.

General Building Stock

HAZUS estimates that there are 5,444 buildings in the region which have an aggregate total replacement value of 1,738 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,192,242	68.6%
Commercial	312,057	18.0%
Industrial	177,575	10.2%
Agricultural	9,485	0.5%
Religion	14,245	0.8%
Government	4,992	0.3%
Education	27,015	1.6%
Total	**1,737,611**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	111,183	33.7%
Commercial	136,835	41.5%
Industrial	56,465	17.1%
Agricultural	3,654	1.1%
Religion	2,902	0.9%
Government	1,506	0.5%
Education	17,157	5.2%
Total	**329,702**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 6 schools, no fire stations, no police stations and no emergency operation centers.

Flood Scenario Parameters

HAZUS used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Coyote - 6 to 8b
Scenario Name:	User Depth Grid
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

General Building Stock Damage

HAZUS estimates that about 183 buildings will be at least moderately damaged. This is over 5% of the total number of buildings in the scenario. There are an estimated 171 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS Flood technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	10	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	2	1.10	9	4.95	0	0.00	0	0.00	171	93.96
Total	**10**		**3**		**9**		**0**		**0**		**171**	

Table 4: Expected Building Damage by Building Type

	1-10		11-20		21-30		31-40		41-50		Substantially	
Building Type	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	2	66.67	1	33.33	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	171	100.00
Masonry	4	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	3	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	2	18.18	9	81.82	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	0	0	0	0
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	6	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 4,639 tons of debris will be generated. Of the total amount, Finishes comprises 18% of the total, Structure comprises 23% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 186 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 467 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 1,371 people (out of a total population of 16,954) will seek temporary shelter in public shelters.

The total economic loss estimated for the flood is 34.83 million dollars, which represents 10.56 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 34.42 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 22.42% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	5.27	4.05	2.47	0.01	11.79
	Content	2.47	14.03	5.00	0.06	21.56
	Inventory	0.00	0.30	0.74	0.04	1.07
	Subtotal	7.73	**18.37**	**8.21**	**0.11**	**34.42**
Business Interruption						
	Income	0.00	0.11	0.00	0.02	0.13
	Relocation	0.06	0.02	0.00	0.00	0.08
	Rental Income	0.01	0.01	0.00	0.00	0.02
	Wage	0.01	0.10	0.00	0.07	0.18
	Subtotal	**0.08**	**0.24**	**0.00**	**0.10**	**0.41**
ALL	**Total**	**7.81**	**18.61**	**8.21**	**0.20**	**34.83**

Appendix A: County Listing for the Region

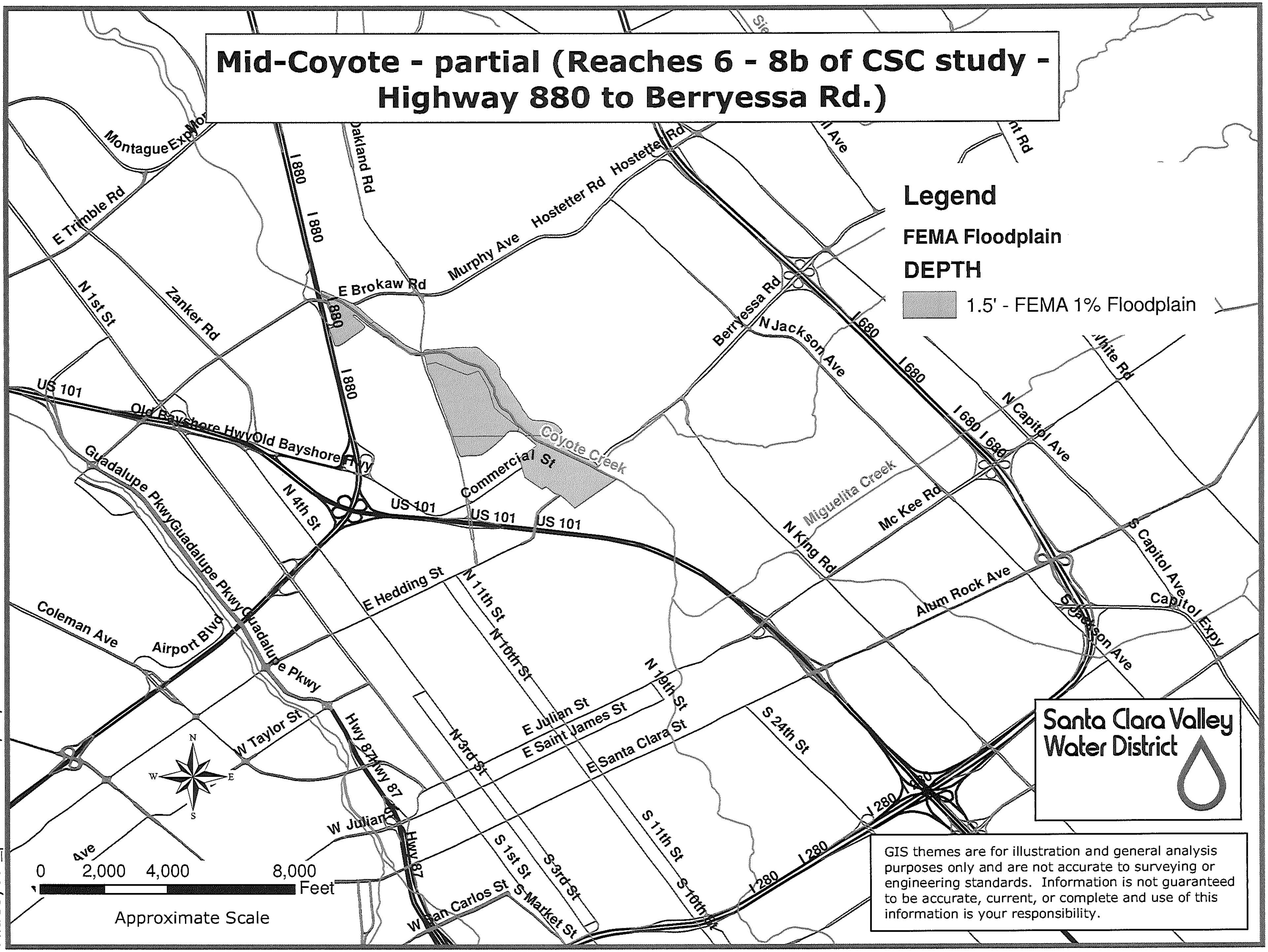
California

- Santa Clara

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
California				
Santa Clara	16,954	1,192,242	545,369	1,737,611
Total	**16,954**	**1,192,242**	**545,369**	**1,737,611**
Total Study Region	**16,954**	**1,192,242**	**545,369**	**1,737,611**

Mid-Coyote - partial (Reaches 6 - 8b of CSC study - Highway 880 to Berryessa Rd.)



MidCoyote_partial.mxd 9/21/2011

HAZUS-MH: Flood Event Report

Region Name: Crosley Sierra

Flood Scenario: User Depth Grid

Print Date: Monday, September 26, 2011

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 9 square miles and contains 228 census blocks. The region contains over 6 thousand households and has a total population of 21,094 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 6,529 buildings in the region with a total building replacement value (excluding contents) of 1,779 million dollars (2006 dollars). Approximately 94.70% of the buildings (and 92.63% of the building value) are associated with residential housing.

General Building Stock

HAZUS estimates that there are 6,529 buildings in the region which have an aggregate total replacement value of 1,779 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,648,279	92.6%
Commercial	84,148	4.7%
Industrial	18,937	1.1%
Agricultural	1,941	0.1%
Religion	5,870	0.3%
Government	3,300	0.2%
Education	16,891	0.9%
Total	**1,779,366**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	941,501	93.1%
Commercial	33,373	3.3%
Industrial	14,098	1.4%
Agricultural	1,176	0.1%
Religion	3,013	0.3%
Government	1,254	0.1%
Education	16,487	1.6%
Total	**1,010,902**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 11 schools, 1 fire station, no police stations and no emergency operation centers.

Flood Scenario Parameters

HAZUS used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Crosley Sierra
Scenario Name:	User Depth Grid
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

General Building Stock Damage

HAZUS estimates that about 694 buildings will be at least moderately damaged. This is over 39% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS Flood technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	15	2.12	173	24.44	520	73.45	0	0.00	0	0.00	0	0.00
Total	**15**		**173**		**521**		**0**		**0**		**0**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	15	2.12	173	24.44	520	73.45	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	1	0	0	0
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	11	7	0	7

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 5,924 tons of debris will be generated. Of the total amount, Finishes comprises 100% of the total, Structure comprises 0% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 237 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 2,623 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 7,633 people (out of a total population of 21,094) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 77.78 million dollars, which represents 7.69 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 77.33 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 88.28% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	43.75	1.83	0.60	0.01	46.18
	Content	24.69	5.41	0.80	0.03	30.93
	Inventory	0.00	0.06	0.16	0.01	0.22
	Subtotal	**68.45**	**7.29**	**1.55**	**0.05**	**77.33**
Business Interruption						
	Income	0.00	0.03	0.00	0.03	0.05
	Relocation	0.19	0.00	0.00	0.00	0.19
	Rental Income	0.03	0.00	0.00	0.00	0.03
	Wage	0.00	0.03	0.00	0.14	0.17
	Subtotal	**0.22**	**0.06**	**0.00**	**0.17**	**0.44**
ALL	**Total**	**68.66**	**7.35**	**1.55**	**0.21**	**77.78**

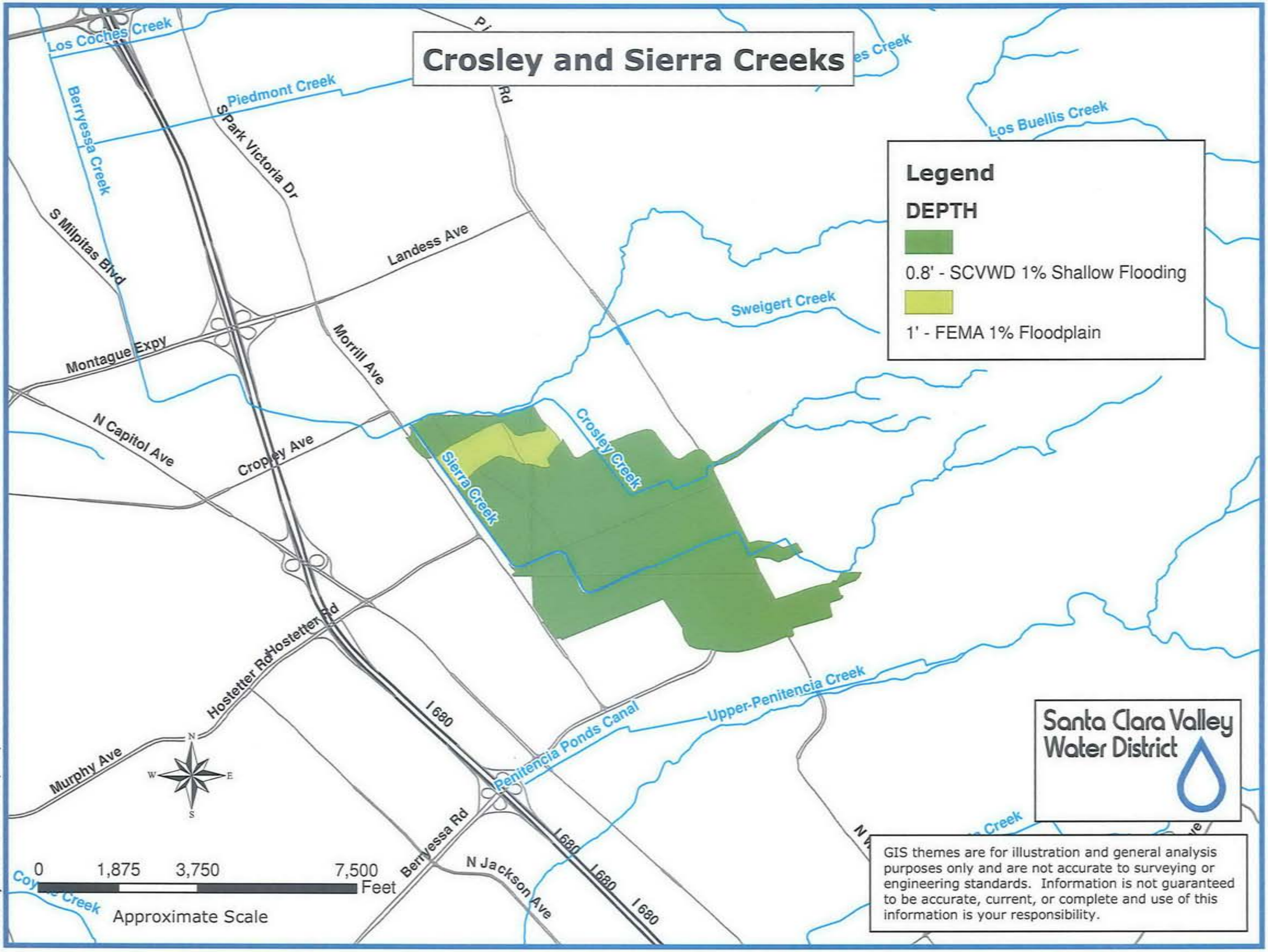
Appendix A: County Listing for the Region

California

- Santa Clara

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
California				
Santa Clara	21,094	1,648,279	131,087	1,779,366
Total	**21,094**	**1,648,279**	**131,087**	**1,779,366**
Total Study Region	**21,094**	**1,648,279**	**131,087**	**1,779,366**



CrosleySierra.mxd 9/26/2011

HAZUS-MH: Flood Event Report

Region Name: Upper Guadalupe River

Flood Scenario: User Depth Grid

Print Date: Wednesday, April 06, 2011

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 15 square miles and contains 999 census blocks. The region contains over 32 thousand households and has a total population of 91,217 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 29,423 buildings in the region with a total building replacement value (excluding contents) of 8,581 million dollars (2006 dollars). Approximately 91.67% of the buildings (and 80.65% of the building value) are associated with residential housing.

General Building Stock

HAZUS estimates that there are 29,423 buildings in the region which have an aggregate total replacement value of 8,581 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	6,920,303	80.7%
Commercial	1,202,427	14.0%
Industrial	280,468	3.3%
Agricultural	21,618	0.3%
Religion	97,304	1.1%
Government	17,850	0.2%
Education	40,580	0.5%
Total	**8,580,550**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	3,361,484	82.4%
Commercial	499,279	12.2%
Industrial	137,240	3.4%
Agricultural	4,460	0.1%
Religion	53,267	1.3%
Government	8,661	0.2%
Education	16,656	0.4%
Total	**4,081,047**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 33 schools, no fire stations, no police stations and no emergency operation centers.

Flood Scenario Parameters

HAZUS used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Upper Guadalupe River
Scenario Name:	User Depth Grid
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

General Building Stock Damage

HAZUS estimates that about 2,340 buildings will be at least moderately damaged. This is over 37% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS Flood technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	3	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	38	63.33	22	36.67	0	0.00	0	0.00	0	0.00	0	0.00
Education	4	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	2	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	4	25.00	1	6.25	11	68.75	0	0.00	0	0.00	0	0.00
Religion	2	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	29	1.24	530	22.70	1,660	71.09	0	0.00	116	4.97	0	0.00
Total	**82**		**553**		**1,671**		**0**		**116**		**0**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	21	91.30	2	8.70	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	116	100.00	0	0.00
Masonry	12	92.31	1	7.69	0	0.00	0	0.00	0	0.00	0	0.00
Steel	6	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	30	1.35	532	23.94	1,660	74.71	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	0	0	0	0
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	33	7	0	7

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 22,273 tons of debris will be generated. Of the total amount, Finishes comprises 100% of the total, Structure comprises 0% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 891 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 9,589 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 27,816 people (out of a total population of 91,217) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 363.63 million dollars, which represents 8.91 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 361.12 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 69.01% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	156.74	19.92	11.12	0.30	188.09
	Content	93.56	57.02	16.92	1.24	168.73
	Inventory	0.00	1.43	2.81	0.06	4.30
	Subtotal	**250.30**	**78.37**	**30.85**	**1.60**	**361.12**
Business Interruption						
	Income	0.00	0.29	0.00	0.03	0.33
	Relocation	0.56	0.08	0.00	0.00	0.65
	Rental Income	0.08	0.05	0.00	0.00	0.13
	Wage	0.01	0.38	0.01	1.01	1.41
	Subtotal	**0.65**	**0.81**	**0.01**	**1.04**	**2.52**
ALL	**Total**	**250.95**	**79.18**	**30.87**	**2.64**	**363.63**

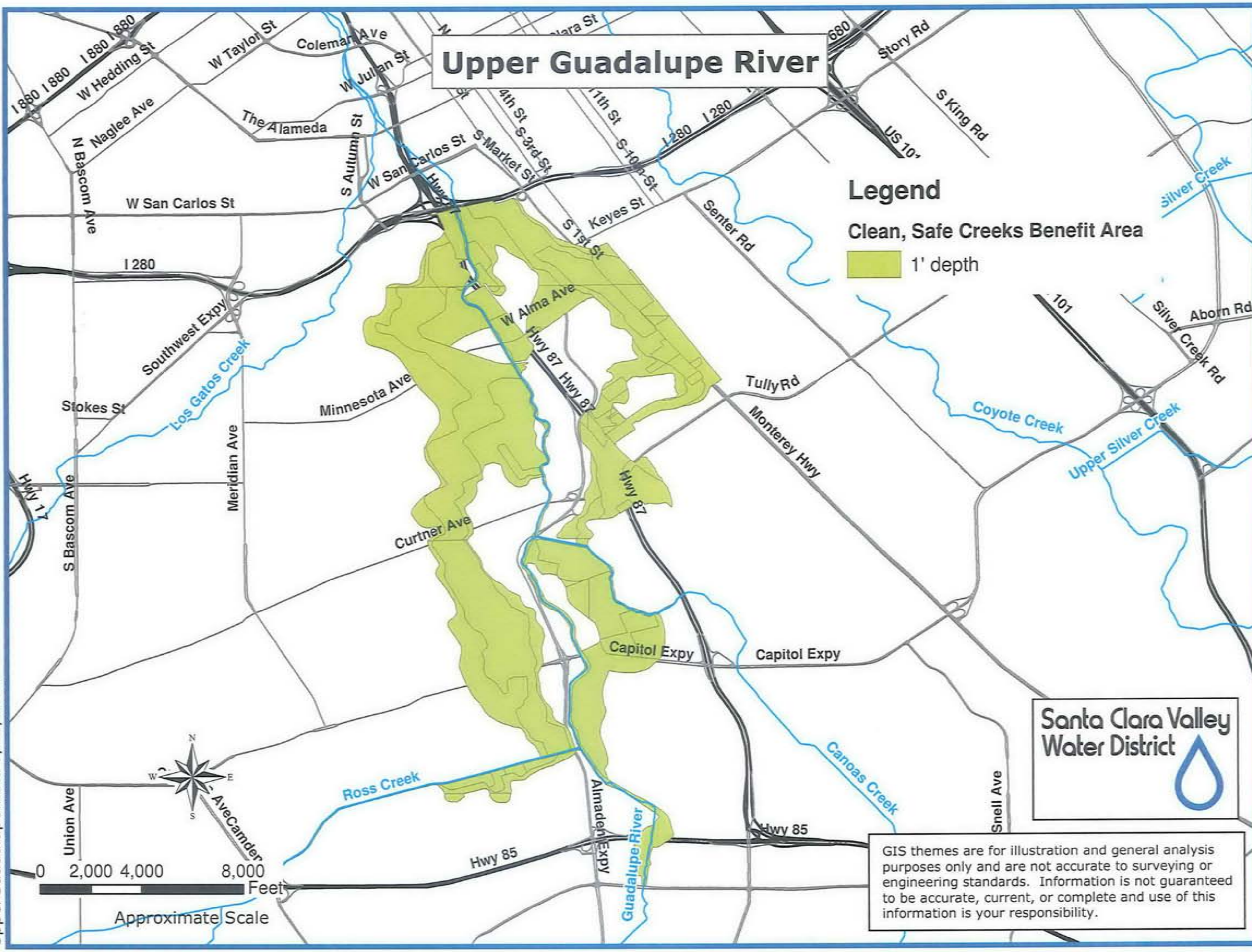
Appendix A: County Listing for the Region

California

- Santa Clara

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
California				
Santa Clara	91,217	6,920,303	1,660,247	8,580,550
Total	**91,217**	**6,920,303**	**1,660,247**	**8,580,550**
Total Study Region	**91,217**	**6,920,303**	**1,660,247**	**8,580,550**



UpperGuadalupe.mxd 9/26/2011

HAZUS-MH: Flood Event Report

Region Name: Llagas Creek - Buena Vista Ave to Wright Ave

Flood Scenario: User Depth Grid - 1 ft

Print Date: Wednesday, March 16, 2011

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 82 square miles and contains 571 census blocks. The region contains over 11 thousand households and has a total population of 36,136 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 12,613 buildings in the region with a total building replacement value (excluding contents) of 3,787 million dollars (2006 dollars). Approximately 89.31% of the buildings (and 70.06% of the building value) are associated with residential housing.

General Building Stock

HAZUS estimates that there are 12,613 buildings in the region which have an aggregate total replacement value of 3,787 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	2,653,074	70.1%
Commercial	720,544	19.0%
Industrial	299,207	7.9%
Agricultural	46,827	1.2%
Religion	24,164	0.6%
Government	15,814	0.4%
Education	27,184	0.7%
Total	**3,786,814**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	628,265	72.0%
Commercial	165,131	18.9%
Industrial	49,183	5.6%
Agricultural	6,180	0.7%
Religion	7,922	0.9%
Government	5,482	0.6%
Education	10,013	1.1%
Total	**872,176**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 93 beds. There are 18 schools, 2 fire stations, 2 police stations and no emergency operation centers.

Flood Scenario Parameters

HAZUS used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Llagas Creek - Buena Vista Ave to Wright Ave
Scenario Name:	User Depth Grid - 1 ft
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

General Building Stock Damage

HAZUS estimates that about 174 buildings will be at least moderately damaged. This is over 32% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS Flood technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	5	71.43	2	28.57	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	3	1.71	32	18.29	128	73.14	0	0.00	12	6.86	0	0.00
Total	**9**		**34**		**128**		**0**		**12**		**0**	

Table 4: Expected Building Damage by Building Type

Building	1-10		11-20		21-30		31-40		41-50		Substantially	
Type	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	12	100.00	0	0.00
Masonry	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	3	1.83	33	20.12	128	78.05	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 93 hospital beds available for use. On the day of the scenario flood event, the model estimates that 93 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	2	2	0	2
Hospitals	1	0	0	0
Police Stations	2	2	0	2
Schools	18	2	0	2

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 1,896 tons of debris will be generated. Of the total amount, Finishes comprises 100% of the total, Structure comprises 0% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 76 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 1,230 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 3,135 people (out of a total population of 36,136) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 63.44 million dollars, which represents 7.27 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 62.48 million dollars. 2% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 40.32% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	15.86	7.42	2.07	0.08	25.43
	Content	9.68	22.97	2.98	0.45	36.07
	Inventory	0.00	0.35	0.60	0.04	0.98
	Subtotal	**25.53**	**30.74**	**5.65**	**0.57**	**62.48**
Business Interruption						
	Income	0.00	0.15	0.00	0.01	0.16
	Relocation	0.03	0.02	0.00	0.00	0.05
	Rental Income	0.01	0.01	0.00	0.00	0.02
	Wage	0.00	0.14	0.00	0.58	0.73
	Subtotal	**0.05**	**0.32**	**0.00**	**0.59**	**0.96**
ALL	**Total**	**25.58**	**31.06**	**5.65**	**1.15**	**63.44**

Appendix A: County Listing for the Region

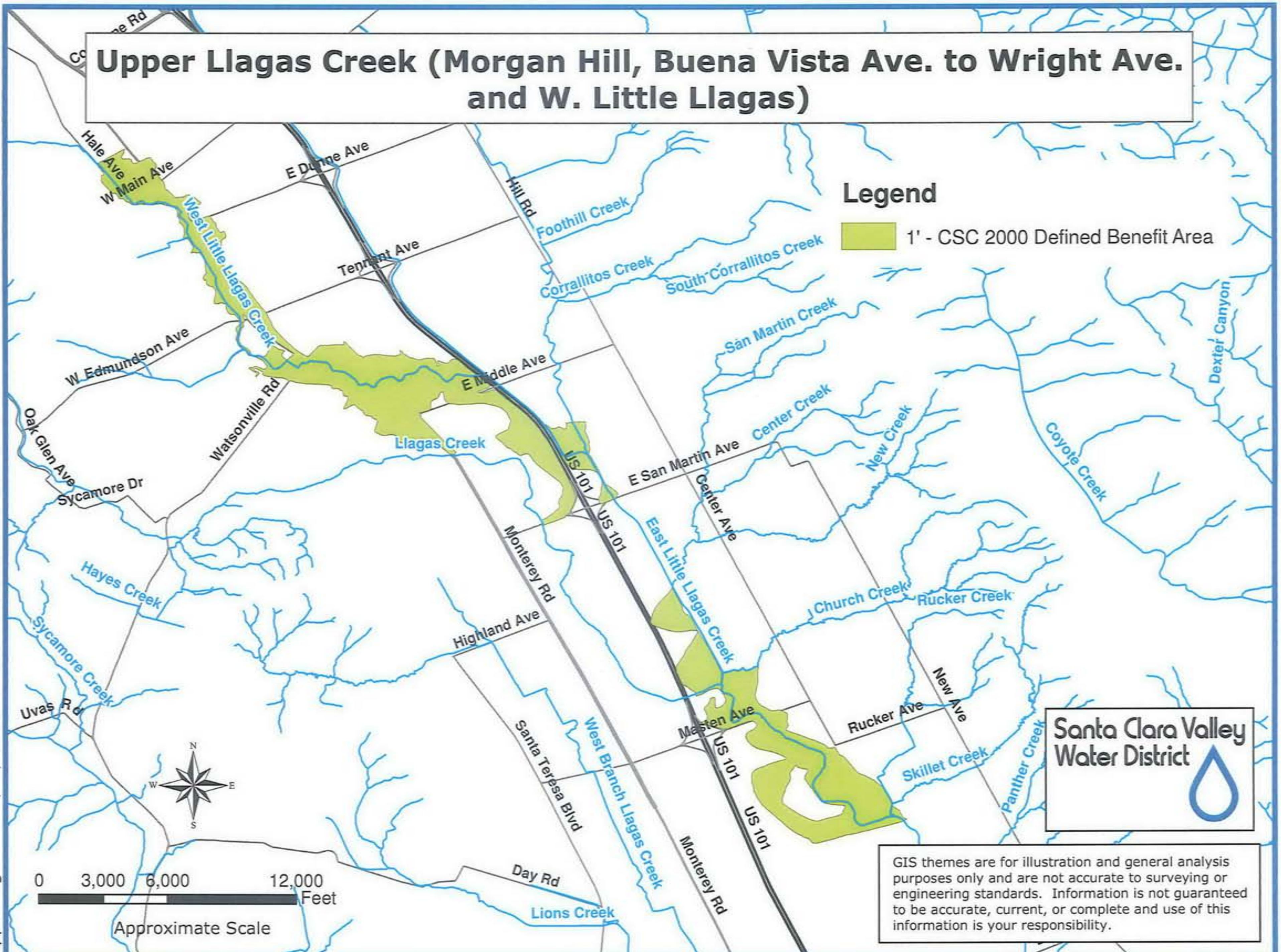
California

- Santa Clara

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
California				
Santa Clara	36,136	2,653,074	1,133,740	3,786,814
Total	**36,136**	**2,653,074**	**1,133,740**	**3,786,814**
Total Study Region	**36,136**	**2,653,074**	**1,133,740**	**3,786,814**

Upper Llagas Creek (Morgan Hill, Buena Vista Ave. to Wright Ave. and W. Little Llagas)



UpperLlagas.mxd 9/20/2011

HAZUS-MH: Flood Event Report

Region Name: Upper Penitencia

Flood Scenario: User Depth Grid

Print Date: Tuesday, May 24, 2011

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 33 square miles and contains 1,516 census blocks. The region contains over 46 thousand households and has a total population of 163,247 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 41,924 buildings in the region with a total building replacement value (excluding contents) of 14,824 million dollars (2006 dollars). Approximately 90.95% of the buildings (and 69.33% of the building value) are associated with residential housing.

General Building Stock

HAZUS estimates that there are 41,924 buildings in the region which have an aggregate total replacement value of 14,824 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	10,277,274	69.3%
Commercial	2,540,682	17.1%
Industrial	1,737,980	11.7%
Agricultural	21,777	0.1%
Religion	112,522	0.8%
Government	28,590	0.2%
Education	105,360	0.7%
Total	**14,824,185**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	3,322,383	76.7%
Commercial	593,402	13.7%
Industrial	340,110	7.8%
Agricultural	4,784	0.1%
Religion	22,358	0.5%
Government	9,944	0.2%
Education	40,163	0.9%
Total	**4,333,144**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 192 beds. There are 52 schools, 2 fire stations, no police stations and no emergency operation centers.

Flood Scenario Parameters

HAZUS used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Permanente - with Cuesta - depths 2 ft or less
Scenario Name:	User Depth Grid
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

General Building Stock Damage

HAZUS estimates that about 1,814 buildings will be at least moderately damaged. This is over 38% of the total number of buildings in the scenario. There are an estimated 27 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS Flood technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	41	66.13	21	33.87	0	0.00	0	0.00	0	0.00	0	0.00
Education	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	16	44.44	16	44.44	4	11.11	0	0.00	0	0.00	0	0.00
Religion	2	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	16	0.89	451	25.21	1,290	72.11	0	0.00	5	0.28	27	1.51
Total	**77**		**488**		**1,294**		**0**		**5**		**27**	

Table 4: Expected Building Damage by Building Type

	1-10		11-20		21-30		31-40		41-50		Substantially	
Building Type	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	27	67.50	13	32.50	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	5	15.63	27	84.38
Masonry	14	77.78	4	22.22	0	0.00	0	0.00	0	0.00	0	0.00
Steel	12	70.59	5	29.41	0	0.00	0	0.00	0	0.00	0	0.00
Wood	14	0.80	452	25.74	1,290	73.46	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 192 hospital beds available for use. On the day of the scenario flood event, the model estimates that 192 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	2	0	0	0
Hospitals	1	0	0	0
Police Stations	0	0	0	0
Schools	52	7	0	7

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 14,198 tons of debris will be generated. Of the total amount, Finishes comprises 98% of the total, Structure comprises 1% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 568 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 9,072 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 26,131 people (out of a total population of 163,247) will seek temporary shelter in public shelters.

The total economic loss estimated for the flood is 442.69 million dollars, which represents 10.22 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 439.89 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 53.50% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	139.85	27.53	26.87	0.22	194.46
	Content	96.46	74.14	63.93	0.82	235.35
	Inventory	0.00	1.72	8.31	0.04	10.07
	Subtotal	**236.31**	**103.39**	**99.10**	**1.08**	**439.89**
Business Interruption						
	Income	0.01	0.55	0.02	0.05	0.63
	Relocation	0.43	0.14	0.03	0.00	0.60
	Rental Income	0.08	0.10	0.01	0.00	0.19
	Wage	0.02	0.54	0.05	0.79	1.39
	Subtotal	**0.54**	**1.33**	**0.10**	**0.84**	**2.81**
ALL	**Total**	**236.85**	**104.72**	**99.20**	**1.92**	**442.69**

Appendix A: County Listing for the Region

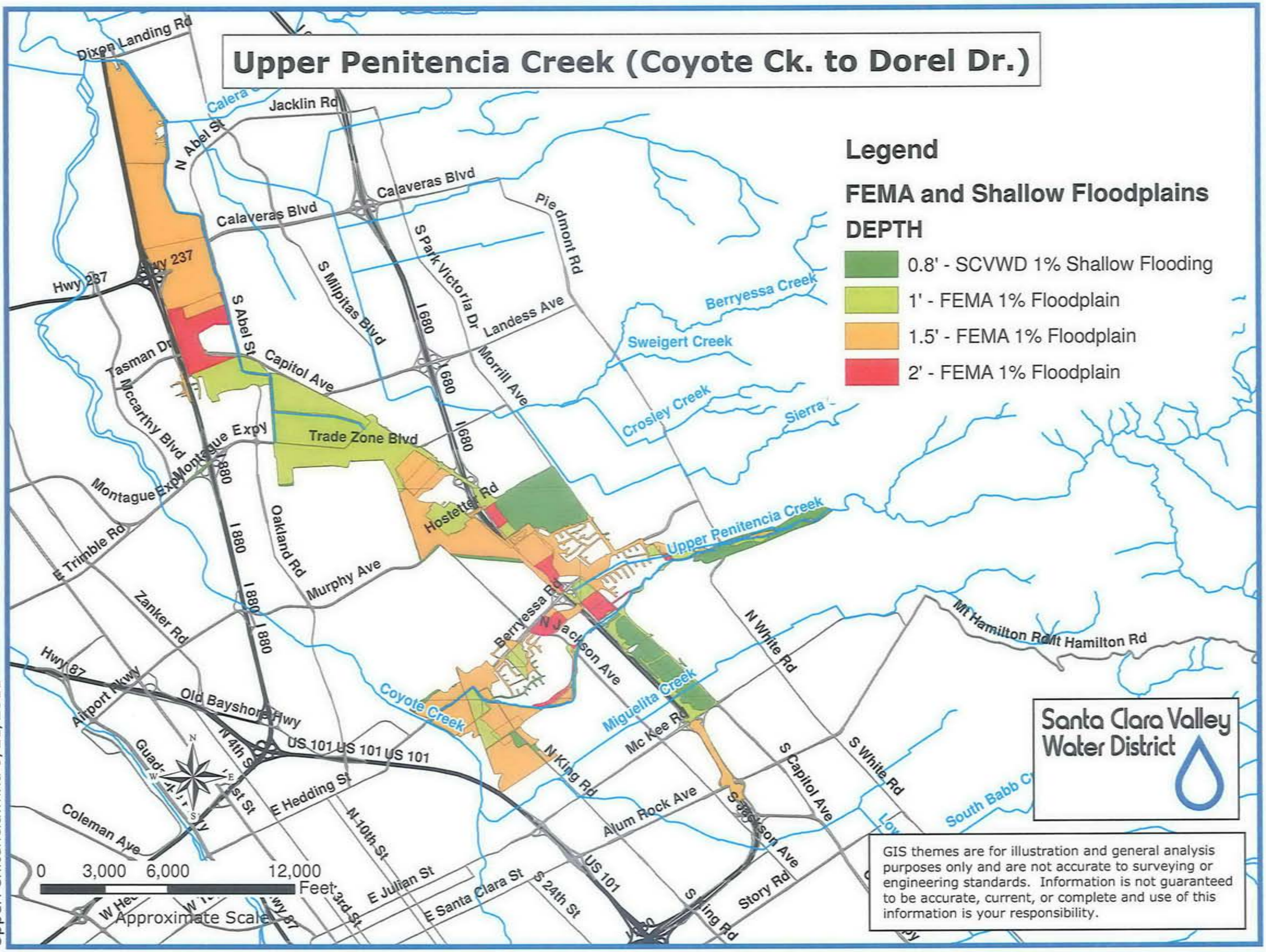
California

- Santa Clara

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
California				
Santa Clara	163,247	10,277,274	4,546,911	14,824,185
Total	**163,247**	**10,277,274**	**4,546,911**	**14,824,185**
Total Study Region	**163,247**	**10,277,274**	**4,546,911**	**14,824,185**

Upper Penitencia Creek (Coyote Ck. to Dorel Dr.)



UpperPenitencia.mxd 9/21/2011

HAZUS-MH: Flood Event Report

Region Name: Permanente - with Cuesta - depths 2 ft or less

Flood Scenario: User Depth Grid

Print Date: Wednesday, July 06, 2011

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 5 square miles and contains 341 census blocks. The region contains over 9 thousand households and has a total population of 24,379 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 9,310 buildings in the region with a total building replacement value (excluding contents) of 3,142 million dollars (2006 dollars). Approximately 92.31% of the buildings (and 87.49% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

HAZUS estimates that there are 9,310 buildings in the region which have an aggregate total replacement value of 3,142 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	2,748,968	87.5%
Commercial	280,569	8.9%
Industrial	25,648	0.8%
Agricultural	27,794	0.9%
Religion	19,689	0.6%
Government	1,468	0.0%
Education	37,887	1.2%
Total	**3,142,023**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	589,160	82.8%
Commercial	82,118	11.5%
Industrial	4,598	0.6%
Agricultural	24,026	3.4%
Religion	5,582	0.8%
Government	0	0.0%
Education	6,072	0.9%
Total	**711,556**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 286 beds. There are 17 schools, no fire stations, no police stations and no emergency operation centers.

Flood Scenario Parameters

HAZUS used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Permanente - with Cuesta - depths 2 ft or less
Scenario Name:	User Depth Grid
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

General Building Stock Damage

HAZUS estimates that about 4 buildings will be at least moderately damaged. This is over 1% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS Flood technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	4	100.00	0	0.00	0	0.00	0	0.00
Total	**0**		**0**		**4**		**0**		**0**		**0**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	0	0.00	4	100.00	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 286 hospital beds available for use. On the day of the scenario flood event, the model estimates that 286 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	0	0	0	0
Hospitals	1	0	0	0
Police Stations	0	0	0	0
Schools	17	2	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 135 tons of debris will be generated. Of the total amount, Finishes comprises 100% of the total, Structure comprises 0% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 5 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 406 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 920 people (out of a total population of 24,379) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 3.17 million dollars, which represents 0.44 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 2.90 million dollars. 8% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 47.11% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.88	0.28	0.01	0.00	1.17
	Content	0.58	1.14	0.01	0.00	1.73
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**1.46**	**1.42**	**0.02**	**0.00**	**2.90**
Business Interruption						
	Income	0.00	0.04	0.00	0.03	0.07
	Relocation	0.03	0.01	0.00	0.00	0.04
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.09	0.00	0.08	0.16
	Subtotal	**0.03**	**0.13**	**0.00**	**0.11**	**0.27**
ALL	**Total**	**1.49**	**1.55**	**0.02**	**0.11**	**3.17**

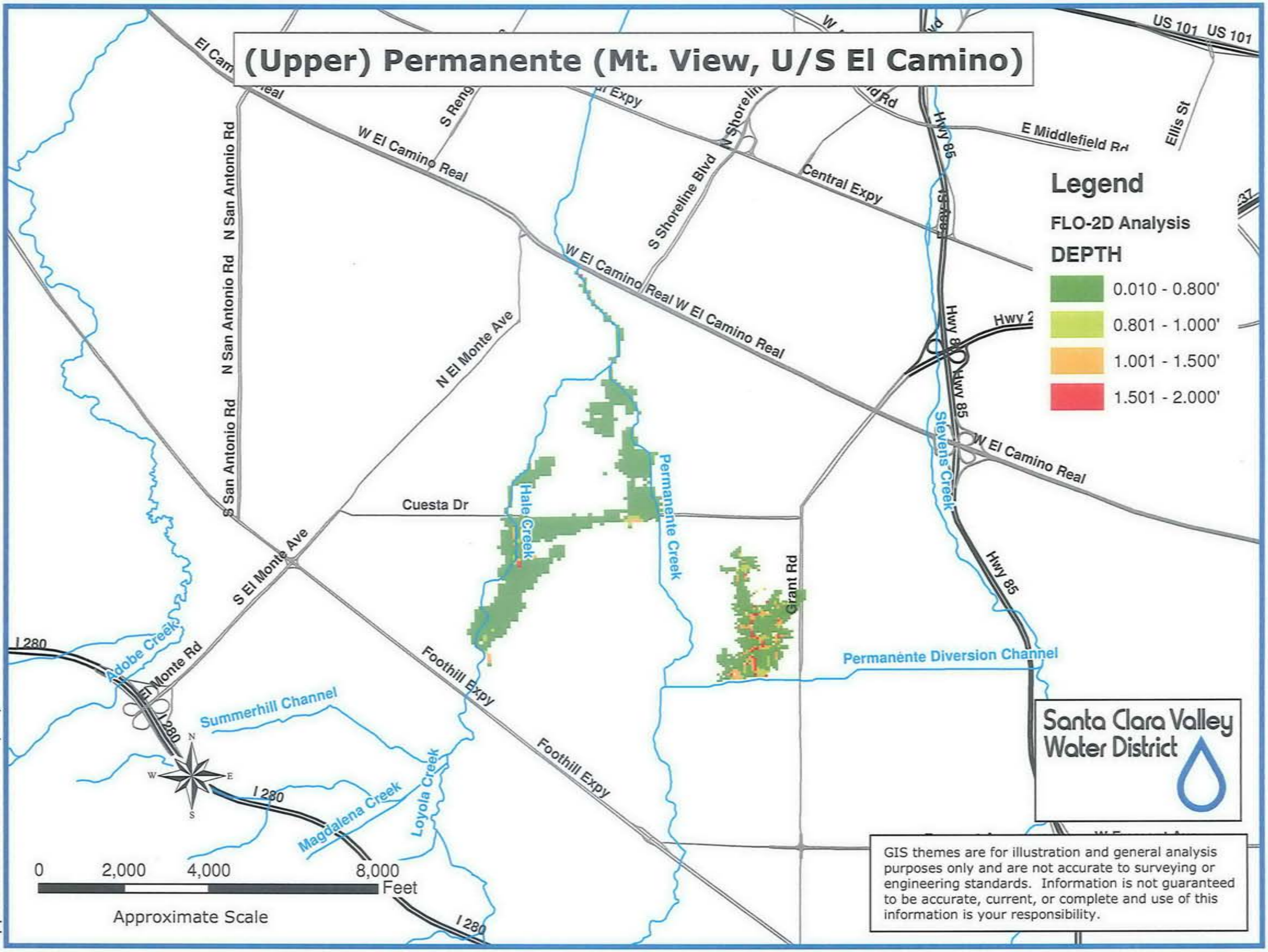
Appendix A: County Listing for the Region

California

- Santa Clara

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
California				
Santa Clara	24,379	2,748,968	393,055	3,142,023
Total	**24,379**	**2,748,968**	**393,055**	**3,142,023**
Total Study Region	**24,379**	**2,748,968**	**393,055**	**3,142,023**



UpperPermanente.mxd 9/21/2011

HAZUS-MH: Flood Event Report

Region Name: Ruby - Norwood - Quimby - Fowler

Flood Scenario: User Depth Grid

Print Date: Tuesday, September 27, 2011

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 21 square miles and contains 530 census blocks. The region contains over 17 thousand households and has a total population of 68,520 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 17,577 buildings in the region with a total building replacement value (excluding contents) of 5,016 million dollars (2006 dollars). Approximately 93.83% of the buildings (and 91.76% of the building value) are associated with residential housing.

General Building Stock

HAZUS estimates that there are 17,577 buildings in the region which have an aggregate total replacement value of 5,016 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	4,602,464	91.8%
Commercial	311,191	6.2%
Industrial	34,461	0.7%
Agricultural	7,026	0.1%
Religion	22,721	0.5%
Government	485	0.0%
Education	37,209	0.7%
Total	**5,015,557**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,679,790	91.4%
Commercial	125,929	6.8%
Industrial	8,480	0.5%
Agricultural	2,351	0.1%
Religion	10,611	0.6%
Government	48	0.0%
Education	11,237	0.6%
Total	**1,838,446**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 22 schools, no fire stations, no police stations and no emergency operation centers.

Flood Scenario Parameters

HAZUS used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Ruby - Norwood - Quimby - Fowler
Scenario Name:	User Depth Grid
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

General Building Stock Damage

HAZUS estimates that about 1,329 buildings will be at least moderately damaged. This is over 39% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS Flood technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	3	50.00	3	50.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	32	2.36	321	23.64	1,005	74.01	0	0.00	0	0.00	0	0.00
Total	**35**		**324**		**1,005**		**0**		**0**		**0**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	32	2.36	321	23.64	1,005	74.01	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	0	0	0	0
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	22	6	0	6

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 4,392 tons of debris will be generated. Of the total amount, Finishes comprises 100% of the total, Structure comprises 0% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 176 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 5,594 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 16,491 people (out of a total population of 68,520) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 176.37 million dollars, which represents 9.59 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 175.42 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 81.35% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	91.81	7.23	0.83	0.04	99.91
	Content	51.24	22.63	0.97	0.21	75.05
	Inventory	0.00	0.27	0.16	0.04	0.46
	Subtotal	**143.05**	**30.13**	**1.96**	**0.29**	**175.42**
Business Interruption						
	Income	0.00	0.14	0.00	0.04	0.17
	Relocation	0.36	0.01	0.00	0.00	0.37
	Rental Income	0.06	0.01	0.00	0.00	0.06
	Wage	0.00	0.14	0.00	0.19	0.34
	Subtotal	**0.42**	**0.29**	**0.00**	**0.23**	**0.95**
ALL	**Total**	**143.48**	**30.42**	**1.96**	**0.52**	**176.37**

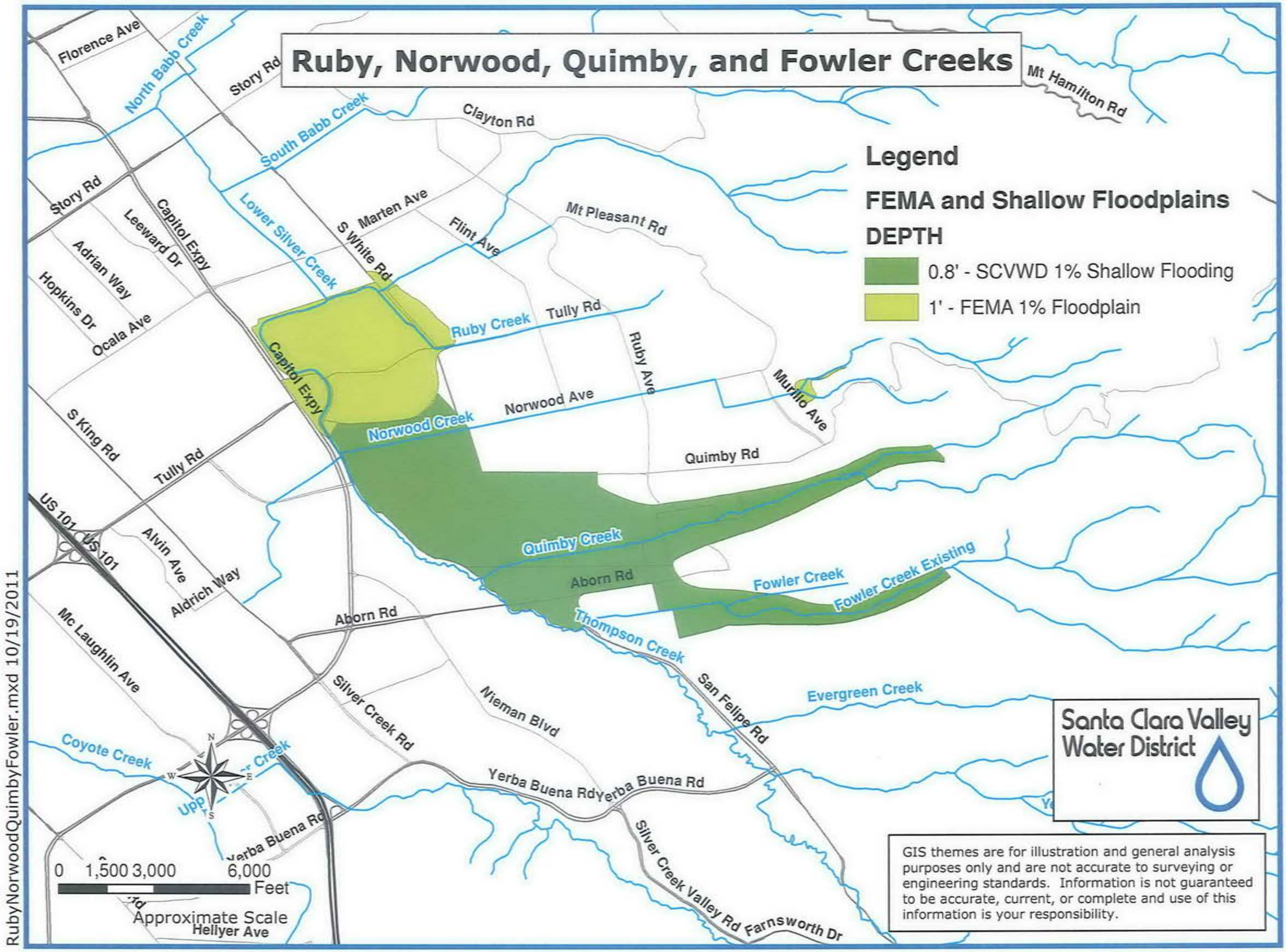
Appendix A: County Listing for the Region

California

- Santa Clara

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
California				
Santa Clara	68,520	4,602,464	413,093	5,015,557
Total	**68,520**	**4,602,464**	**413,093**	**5,015,557**
Total Study Region	**68,520**	**4,602,464**	**413,093**	**5,015,557**


Ruby, Norwood, Quimby, and Fowler Creeks
Legend
FEMA and Shallow Floodplains
DEPTH
0.8' - SCVWD 1% Shallow Flooding
1' - FEMA 1% Floodplain
Florence Ave
North Babb Creek
Story Rd
South Babb Creek
Clayton Rd
Mt Hamilton Rd
Lower Silver Creek
S Marten Ave
S White Rd
Flint Ave
Mt Pleasant Rd
Capitol Expy
Leeward Dr
Adrian Way
Hopkins Dr
Ocala Ave
Ruby Creek
Tully Rd
Ruby Ave
Murillo Ave
Norwood Creek
Norwood Ave
S King Rd
Quimby Rd
Quimby Creek
US 101
Alvin Ave
Aldrich Way
Aborn Rd
Fowler Creek
Fowler Creek Existing
Thompson Creek
Mc Laughlin Ave
Silver Creek Rd
Nieman Blvd
San Felipe Rd
Evergreen Creek
Coyote Creek
Yerba Buena Rd
Silver Creek Valley Rd
Farnsworth Dr
Hellyer Ave
0 1,500 3,000 6,000
Feet
Approximate Scale
Santa Clara Valley Water District
GIS themes are for illustration and general analysis purposes only and are not accurate to surveying or engineering standards. Information is not guaranteed to be accurate, current, or complete and use of this information is your responsibility.
RubyNorwoodQuimbyFowler.mxd 10/19/2011

HAZUS-MH: Flood Event Report

Region Name: San Francisquito - all

Flood Scenario: User Depth Grid

Print Date: Friday, May 06, 2011

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 11 square miles and contains 423 census blocks. The region contains over 11 thousand households and has a total population of 24,717 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 9,481 buildings in the region with a total building replacement value (excluding contents) of 3,859 million dollars (2006 dollars). Approximately 88.08% of the buildings (and 69.42% of the building value) are associated with residential housing.

General Building Stock

HAZUS estimates that there are 9,481 buildings in the region which have an aggregate total replacement value of 3,859 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	2,679,342	69.4%
Commercial	936,000	24.3%
Industrial	168,156	4.4%
Agricultural	4,031	0.1%
Religion	45,601	1.2%
Government	5,888	0.2%
Education	20,427	0.5%
Total	**3,859,445**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,394,457	83.7%
Commercial	198,846	11.9%
Industrial	49,427	3.0%
Agricultural	954	0.1%
Religion	15,126	0.9%
Government	473	0.0%
Education	7,535	0.5%
Total	**1,666,818**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 8 schools, 1 fire station, 1 police station and no emergency operation centers.

Flood Scenario Parameters

HAZUS used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	San Francisquito - all
Scenario Name:	User Depth Grid
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

General Building Stock Damage

HAZUS estimates that about 1,034 buildings will be at least moderately damaged. This is over 39% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS Flood technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	1	4.55	21	95.45	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	2	66.67	1	33.33	0	0.00	0	0.00	0	0.00
Religion	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	4	0.39	279	27.51	731	72.09	0	0.00	0	0.00	0	0.00
Total	**7**		**302**		**732**		**0**		**0**		**0**	

Table 4: Expected Building Damage by Building Type

	1-10		11-20		21-30		31-40		41-50		Substantially	
Building Type	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	1	20.00	4	80.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	0	0.00	5	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	2	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	3	0.30	282	27.76	731	71.95	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	1	0	0	0
Hospitals	0	0	0	0
Police Stations	1	0	0	0
Schools	8	4	0	4

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 11,150 tons of debris will be generated. Of the total amount, Finishes comprises 100% of the total, Structure comprises 0% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 446 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 3,289 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 9,487 people (out of a total population of 24,717) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 208.05 million dollars, which represents 12.48 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 206.72 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 73.50% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	90.37	11.77	2.47	0.13	104.74
	Content	62.21	31.89	6.23	0.36	100.69
	Inventory	0.00	0.30	0.96	0.03	1.29
	Subtotal	**152.59**	**43.97**	**9.65**	**0.52**	**206.72**
Business Interruption						
	Income	0.00	0.28	0.01	0.02	0.31
	Relocation	0.28	0.06	0.01	0.00	0.35
	Rental Income	0.06	0.04	0.00	0.00	0.10
	Wage	0.00	0.26	0.01	0.31	0.57
	Subtotal	**0.34**	**0.64**	**0.02**	**0.33**	**1.33**
ALL	**Total**	**152.93**	**44.60**	**9.67**	**0.85**	**208.05**

Appendix A: County Listing for the Region

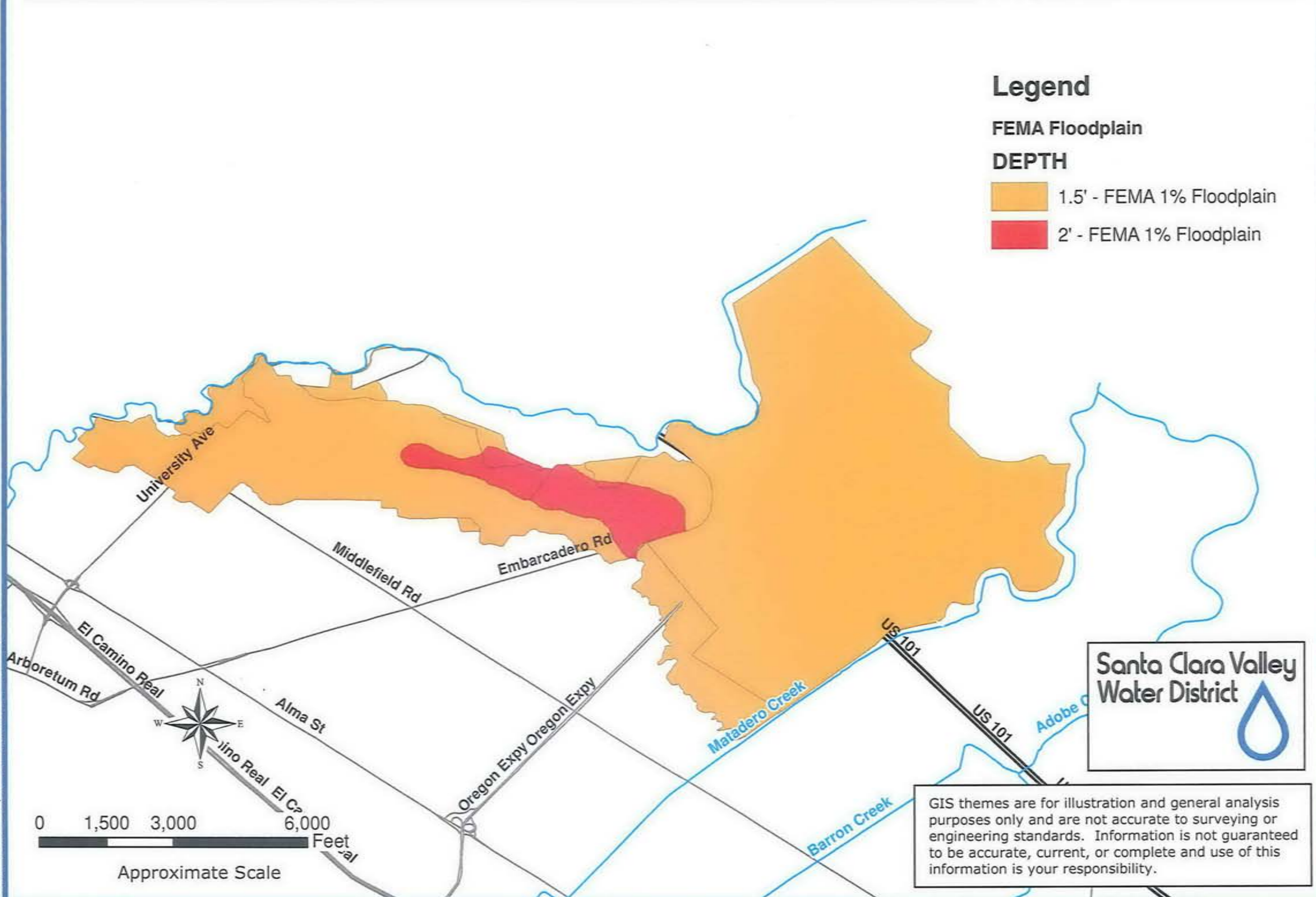
California

- Santa Clara

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars) Residential	Non-Residential	Total
California				
Santa Clara	24,717	2,679,342	1,180,103	3,859,445
Total	**24,717**	**2,679,342**	**1,180,103**	**3,859,445**
Total Study Region	**24,717**	**2,679,342**	**1,180,103**	**3,859,445**

San Francisquito Creek (SF Bay to Searsville Dam - Santa Clara Co. only)



SanFrancisquito_all.mxd 9/21/2011

HAZUS-MH: Flood Event Report

Region Name: San Francisquito - ds 101

Flood Scenario: User Depth Grid

Print Date: Friday, May 06, 2011

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

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General Description of the Region

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The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 7 square miles and contains 66 census blocks. The region contains over 1 thousand households and has a total population of 1,418 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 858 buildings in the region with a total building replacement value (excluding contents) of 655 million dollars (2006 dollars). Approximately 71.91% of the buildings (and 10.97% of the building value) are associated with residential housing.

General Building Stock

HAZUS estimates that there are 858 buildings in the region which have an aggregate total replacement value of 655 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	71,931	11.0%
Commercial	434,335	66.3%
Industrial	131,153	20.0%
Agricultural	1,323	0.2%
Religion	9,596	1.5%
Government	473	0.1%
Education	6,678	1.0%
Total	**655,489**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	67	0.0%
Commercial	83,272	61.8%
Industrial	43,544	32.3%
Agricultural	0	0.0%
Religion	4,206	3.1%
Government	473	0.4%
Education	3,264	2.4%
Total	**134,826**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 1 school, no fire stations, no police stations and no emergency operation centers.

Flood Scenario Parameters

HAZUS used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	San Francisquito - ds 101
Scenario Name:	User Depth Grid
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

General Building Stock Damage

HAZUS estimates that about 3 buildings will be at least moderately damaged. This is over 43% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS Flood technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	2	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**0**		**3**		**0**		**0**		**0**		**0**	

Table 4: Expected Building Damage by Building Type

Building	1-10		11-20		21-30		31-40		41-50		Substantially	
Type	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	0	0	0	0
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	1	1	0	1

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 68 tons of debris will be generated. Of the total amount, Finishes comprises 92% of the total, Structure comprises 2% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 3 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 0 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 0 people (out of a total population of 1,418) will seek temporary shelter in public shelters.

The total economic loss estimated for the flood is 20.04 million dollars, which represents 14.86 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 19.52 million dollars. 3% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 0.04% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.01	3.53	1.61	0.01	5.16
	Content	0.00	8.39	5.05	0.04	13.48
	Inventory	0.00	0.11	0.77	0.00	0.88
	Subtotal	**0.01**	**12.03**	**7.44**	**0.05**	**19.52**
Business Interruption						
	Income	0.00	0.17	0.01	0.01	0.18
	Relocation	0.00	0.05	0.01	0.00	0.05
	Rental Income	0.00	0.03	0.00	0.00	0.03
	Wage	0.00	0.11	0.01	0.13	0.25
	Subtotal	**0.00**	**0.36**	**0.02**	**0.14**	**0.52**
ALL	**Total**	**0.01**	**12.38**	**7.46**	**0.19**	**20.04**

Appendix A: County Listing for the Region

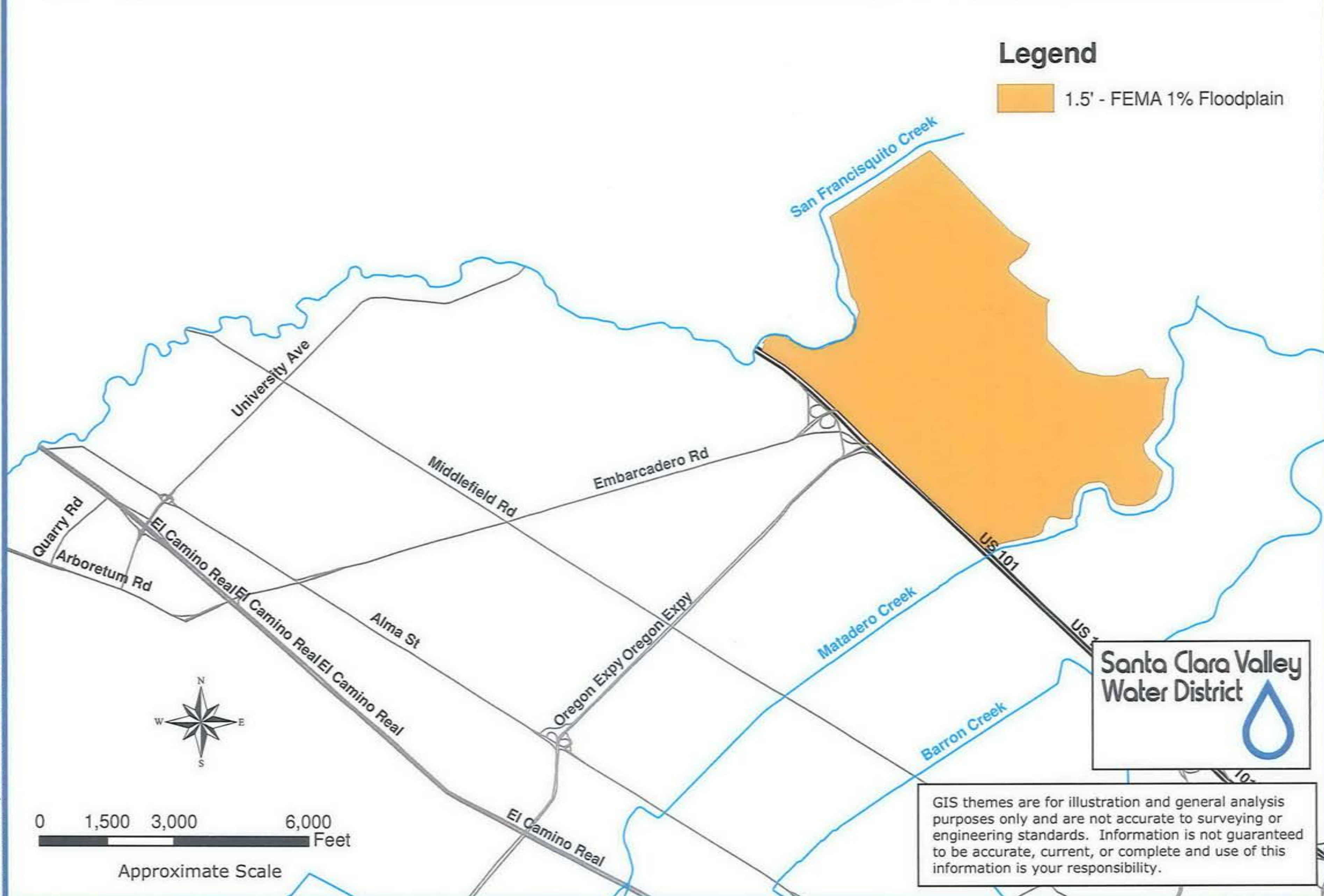
California

- Santa Clara

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
California				
Santa Clara	1,418	71,931	583,558	655,489
Total	**1,418**	**71,931**	**583,558**	**655,489**
Total Study Region	**1,418**	**71,931**	**583,558**	**655,489**

San Francisquito Creek (downstream Hwy 101 - Santa Clara Co. only)



SanFrancisquito_ds101.mxd 9/20/2011

HAZUS-MH: Flood Event Report

Region Name: San Tomas Aquino - SPRR to Upstream of Williams Rd

Flood Scenario: User Depth Grid

Print Date: Tuesday, April 05, 2011

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 10 square miles and contains 547 census blocks. The region contains over 24 thousand households and has a total population of 60,801 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 16,596 buildings in the region with a total building replacement value (excluding contents) of 6,407 million dollars (2006 dollars). Approximately 88.74% of the buildings (and 69.02% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

HAZUS estimates that there are 16,596 buildings in the region which have an aggregate total replacement value of 6,407 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	4,422,002	69.0%
Commercial	1,220,980	19.1%
Industrial	608,802	9.5%
Agricultural	7,789	0.1%
Religion	79,498	1.2%
Government	5,811	0.1%
Education	62,090	1.0%
Total	**6,406,972**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	2,124,994	86.3%
Commercial	264,494	10.7%
Industrial	38,290	1.6%
Agricultural	4,012	0.2%
Religion	14,801	0.6%
Government	0	0.0%
Education	15,189	0.6%
Total	**2,461,780**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 249 beds. There are 19 schools, no fire stations, no police stations and no emergency operation centers.

Flood Scenario Parameters

HAZUS used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	San Tomas Aquino - SPRR to Upstream of Williams Rd
Scenario Name:	User Depth Grid
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

General Building Stock Damage

HAZUS estimates that about 1,430 buildings will be at least moderately damaged. This is over 39% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS Flood technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	3	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	21	52.50	19	47.50	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	1	16.67	5	83.33	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	31	2.16	408	28.41	996	69.36	0	0.00	1	0.07	0	0.00
Total	**55**		**428**		**1,001**		**0**		**1**		**0**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	5	55.56	4	44.44	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	1	100.00	0	0.00
Masonry	2	18.18	8	72.73	1	9.09	0	0.00	0	0.00	0	0.00
Steel	2	50.00	2	50.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	32	2.26	392	27.63	995	70.12	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 249 hospital beds available for use. On the day of the scenario flood event, the model estimates that 249 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	0	0	0	0
Hospitals	1	0	0	0
Police Stations	0	0	0	0
Schools	19	4	0	4

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 15,681 tons of debris will be generated. Of the total amount, Finishes comprises 100% of the total, Structure comprises 0% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 627 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 6,633 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 19,416 people (out of a total population of 60,801) will seek temporary shelter in public shelters.

The total economic loss estimated for the flood is 224.16 million dollars, which represents 9.11 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 223.00 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 78.36% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	108.15	10.35	1.67	0.27	120.43
	Content	66.95	31.38	2.42	0.71	101.47
	Inventory	0.00	0.53	0.49	0.08	1.10
	Subtotal	**175.10**	**42.26**	**4.58**	**1.06**	**223.00**
Business Interruption						
	Income	0.02	0.18	0.00	0.02	0.21
	Relocation	0.35	0.03	0.00	0.00	0.38
	Rental Income	0.13	0.02	0.00	0.00	0.15
	Wage	0.04	0.19	0.00	0.19	0.42
	Subtotal	**0.54**	**0.41**	**0.00**	**0.21**	**1.15**
ALL	**Total**	**175.64**	**42.67**	**4.58**	**1.27**	**224.16**

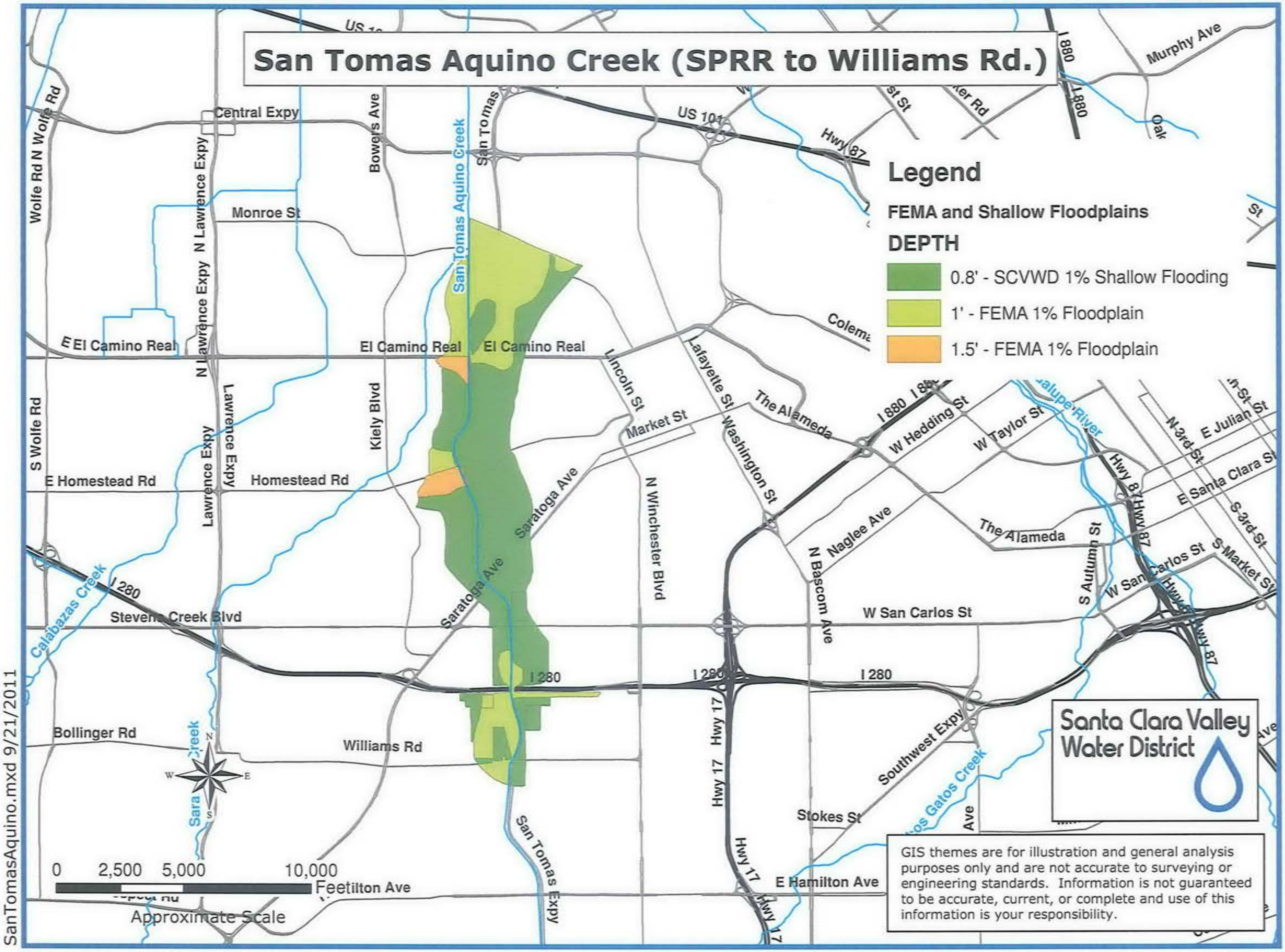
Appendix A: County Listing for the Region

California

- Santa Clara

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars) Residential	Non-Residential	Total
California				
Santa Clara	60,801	4,422,002	1,984,970	6,406,972
Total	**60,801**	**4,422,002**	**1,984,970**	**6,406,972**
Total Study Region	**60,801**	**4,422,002**	**1,984,970**	**6,406,972**


San Tomas Aquino Creek (SPRR to Williams Rd.)
Legend
FEMA and Shallow Floodplains
DEPTH
0.8' - SCVWD 1% Shallow Flooding
1' - FEMA 1% Floodplain
1.5' - FEMA 1% Floodplain
Santa Clara Valley Water District
GIS themes are for illustration and general analysis purposes only and are not accurate to surveying or engineering standards. Information is not guaranteed to be accurate, current, or complete and use of this information is your responsibility.
0 2,500 5,000 10,000 Feet
Approximate Scale
SanTomasAquino.mxd 9/21/2011
Central Expy
Monroe St
El Camino Real
Homestead Rd
Stevens Creek Blvd
Williams Rd
Bollinger Rd
I 280
US 101
Saratoga Ave
San Tomas Aquino Creek
San Tomas Expy
N Winchester Blvd
Hwy 17
W San Carlos St
The Alameda
Southwest Expy
Calabazas Creek
Lawrence Expy
Kiely Blvd
Bowers Ave
Wolfe Rd

HAZUS-MH: Flood Event Report

Region Name: Shoreline

Flood Scenario: User Depth Grid

Print Date: Friday, June 10, 2011

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 43 square miles and contains 744 census blocks. The region contains over 19 thousand households and has a total population of 51,242 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 17,687 buildings in the region with a total building replacement value (excluding contents) of 7,126 million dollars (2006 dollars). Approximately 88.78% of the buildings (and 52.99% of the building value) are associated with residential housing.

General Building Stock

HAZUS estimates that there are 17,687 buildings in the region which have an aggregate total replacement value of 7,126 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	3,776,035	53.0%
Commercial	2,054,504	28.8%
Industrial	1,127,266	15.8%
Agricultural	8,939	0.1%
Religion	49,701	0.7%
Government	49,371	0.7%
Education	60,655	0.9%
Total	**7,126,471**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,111,386	41.9%
Commercial	1,009,047	38.1%
Industrial	457,307	17.3%
Agricultural	3,439	0.1%
Religion	24,817	0.9%
Government	18,091	0.7%
Education	25,873	1.0%
Total	**2,649,960**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 10 schools, 2 fire stations, no police stations and no emergency operation centers.

Flood Scenario Parameters

HAZUS used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Shoreline
Scenario Name:	User Depth Grid
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

General Building Stock Damage

HAZUS estimates that about 1,574 buildings will be at least moderately damaged. This is over 55% of the total number of buildings in the scenario. There are an estimated 72 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS Flood technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	2	6.67	17	56.67	6	20.00	3	10.00	2	6.67	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	2	6.90	10	34.48	16	55.17	1	3.45	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	259	17.06	841	55.40	173	11.40	173	11.40	72	4.74
Total	**4**		**287**		**863**		**177**		**175**		**72**	

Table 4: Expected Building Damage by Building Type

	1-10		11-20		21-30		31-40		41-50		Substantially	
Building Type	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	3	11.11	10	37.04	13	48.15	1	3.70	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	55	100.00
Masonry	0	0.00	3	33.33	5	55.56	1	11.11	0	0.00	0	0.00
Steel	1	10.00	4	40.00	5	50.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	261	17.86	836	57.22	174	11.91	173	11.84	17	1.16

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	2	0	0	0
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	10	4	0	3

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 22,498 tons of debris will be generated. Of the total amount, Finishes comprises 84% of the total, Structure comprises 8% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 900 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 3,087 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 8,918 people (out of a total population of 51,242) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 849.95 million dollars, which represents 32.07 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 844.62 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 29.95% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	155.75	117.65	56.18	0.24	329.83
	Content	98.53	215.63	174.05	1.01	489.22
	Inventory	0.00	3.35	22.04	0.19	25.57
	Subtotal	**254.28**	**336.62**	**252.27**	**1.44**	**844.62**
Business Interruption						
	Income	0.00	1.62	0.03	0.07	1.73
	Relocation	0.25	0.44	0.04	0.00	0.72
	Rental Income	0.06	0.31	0.01	0.00	0.38
	Wage	0.01	0.87	0.05	1.58	2.51
	Subtotal	**0.32**	**3.24**	**0.13**	**1.65**	**5.33**
ALL	**Total**	**254.60**	**339.86**	**252.40**	**3.08**	**849.95**

Appendix A: County Listing for the Region

California

- Santa Clara

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
California				
Santa Clara	51,242	3,776,035	3,350,436	7,126,471
Total	**51,242**	**3,776,035**	**3,350,436**	**7,126,471**
Total Study Region	**51,242**	**3,776,035**	**3,350,436**	**7,126,471**

Appendix E

Hydrology

Requests and responses for Hydrology (1% flows) for the following candidate capital flood projects:

Alamitos Creek
Calera Creek
Canoas Creek
San Tomas Aquino Creek

Hydrology Hydraulics and Geomorphology Service Request Form

Brief Description of Request:

Requested by: Ed Drury	Extension: 2426	Email: edrury@valleywater.org
Job/Project Title: Future Funding	Job/Project No: 00042037	Date of Request: 4/26/11
Unit No: 411	Task No: 0000	Date Required: ASAP or 5/2/11

We need the 1% hydrographs and flood frequency curves for these creeks & locations:

Alamitos @ Sta. 40+00 (D/S Golf Ck), @ Sta. 90+00 (D/S Greystone Ck.)

@ Sta. 130+00 (D/S Randol Ck,), @Sta. 170+00 (D/S Calero Ck.)

@ Sta 220+00 (D/S Almaden Expwy)

Deliverable(s):

1% hydrographs and flood frequency curves on Alamitos.

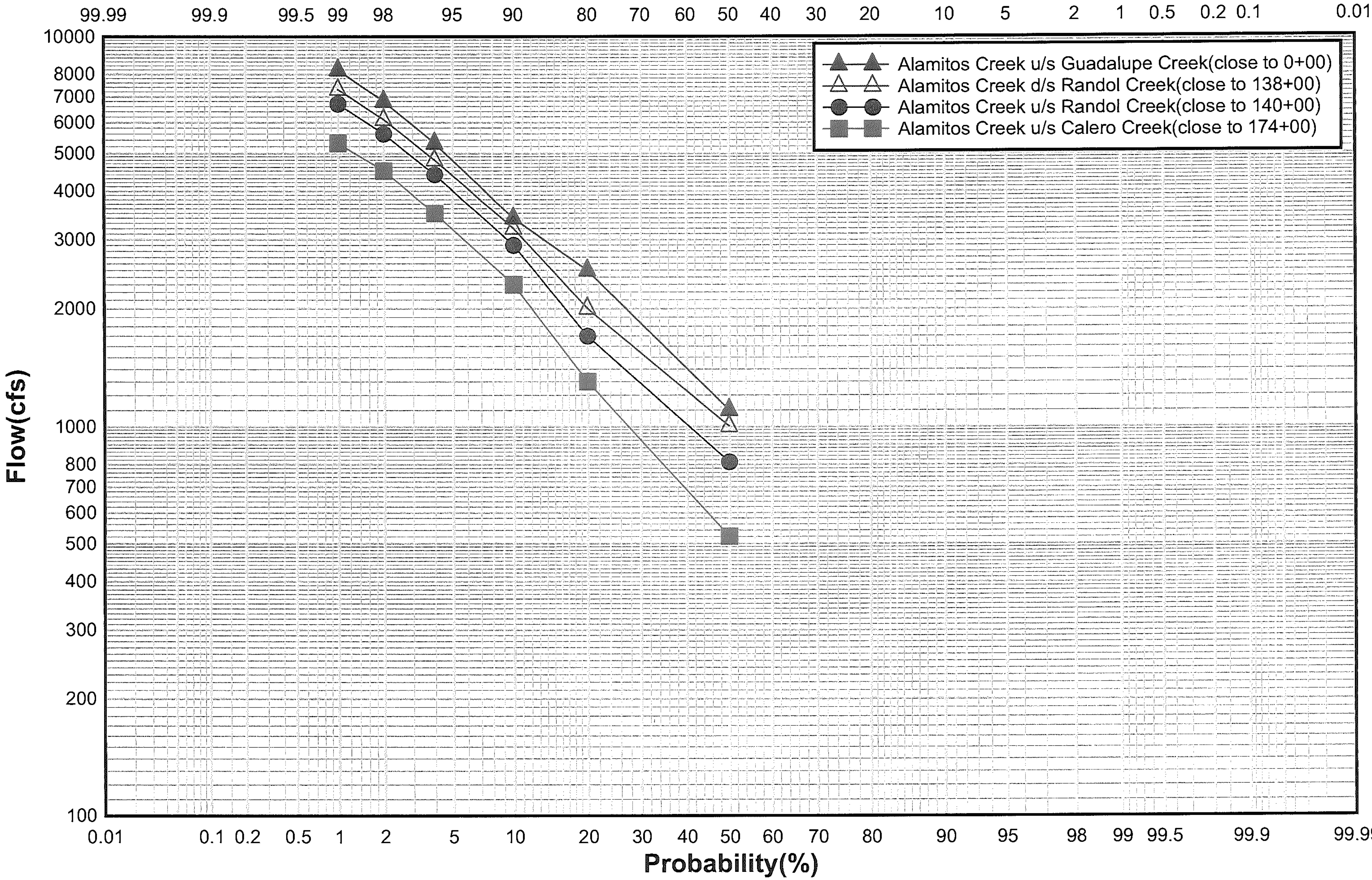
Location	Drainage Area mi^2	2 year cfs	5 year cfs	10 year cfs	25 year cfs	50 year cfs	100 year cfs
Alamitos Creek u/s Calero Creek(close to 174+00)	16.21	520	1,300	2,300	3,500	4,500	5,300
Alamitos Creek u/s Randol Creek(close to 138+00)	29.54	810	1,700	2,900	4,400	5,600	6,700
Alamitos Creek d/s Randol Creek(close to 138+00)	31.84	1,000	2,000	3,200	4,800	6,100	7,300
Alamitos Creek u/s Guadalupe Creek(close to 0+00)	38.34	1,100	2,500	3,400	5,300	6,800	8,200

From COE Model: Guadalupe Watershed Hydrological Assessment prepared by U.S. Army Corps of Engineers San Francisco District November 2009

Data Provided by: Nahm Lee	Date: 4/29/2011
Reviewed by: Wendy Chang	Date:

Flow Frequency Curve

Alamitos Creek



Alamitos Creek

Location	Stn	Model		FEMA [*1]	Green Bk	Hydrology Unit [*2] (Jim Wang)	
		PF1	PF2			100yr	10yr
	18740	4,700	1,400	4,750	4,700		
Arroyo Calero Ck	17422	6,800	2,300	6,750	6,800	5,300	2,300
Randol Ck	14050				6,800	6,700	2,900
	13763	7,400	2,700	7,380	7,400	7,300	3,200
Greystone Ck	9365	7,800	2,900	7,800	7,800		
	5307	4,700	1,900				
Golf Ck	4080			8,680	8,700		
	4022	8,700	3,500	8,860	8,900	8,200	3,400

*1 Based on 1998 Flood Insurance Study, City of San Jose, California, Santa Clara County.

*2 Based on COE: Guadalupe Watershed Hydrological Assessment prepared by U.S. Army Corps of Egnineers, San Francisco District, November 2009.

Hydrology Hydraulics and Geomorphology Service Request Form

Brief Description of Request:

Requested by: **Ed Drury**	**Extension:** **2426**	**Email:** **edrury@valleywater.org**
Job/Project Title: **Future Funding**	**Job/Project No:** **00042037**	**Date of Request:** **4/26/11**
Unit No: **411**	**Task No:** **0000**	**Date Required: ASAP or 5/2/11**

We need the 1% hydrographs and flood frequency curves for Calera creek & locations:

Calera: @ Sta 30+00 (U/S Arizona Ave.)   @ Sta 70+00 (U/S 680)

Deliverable(s):

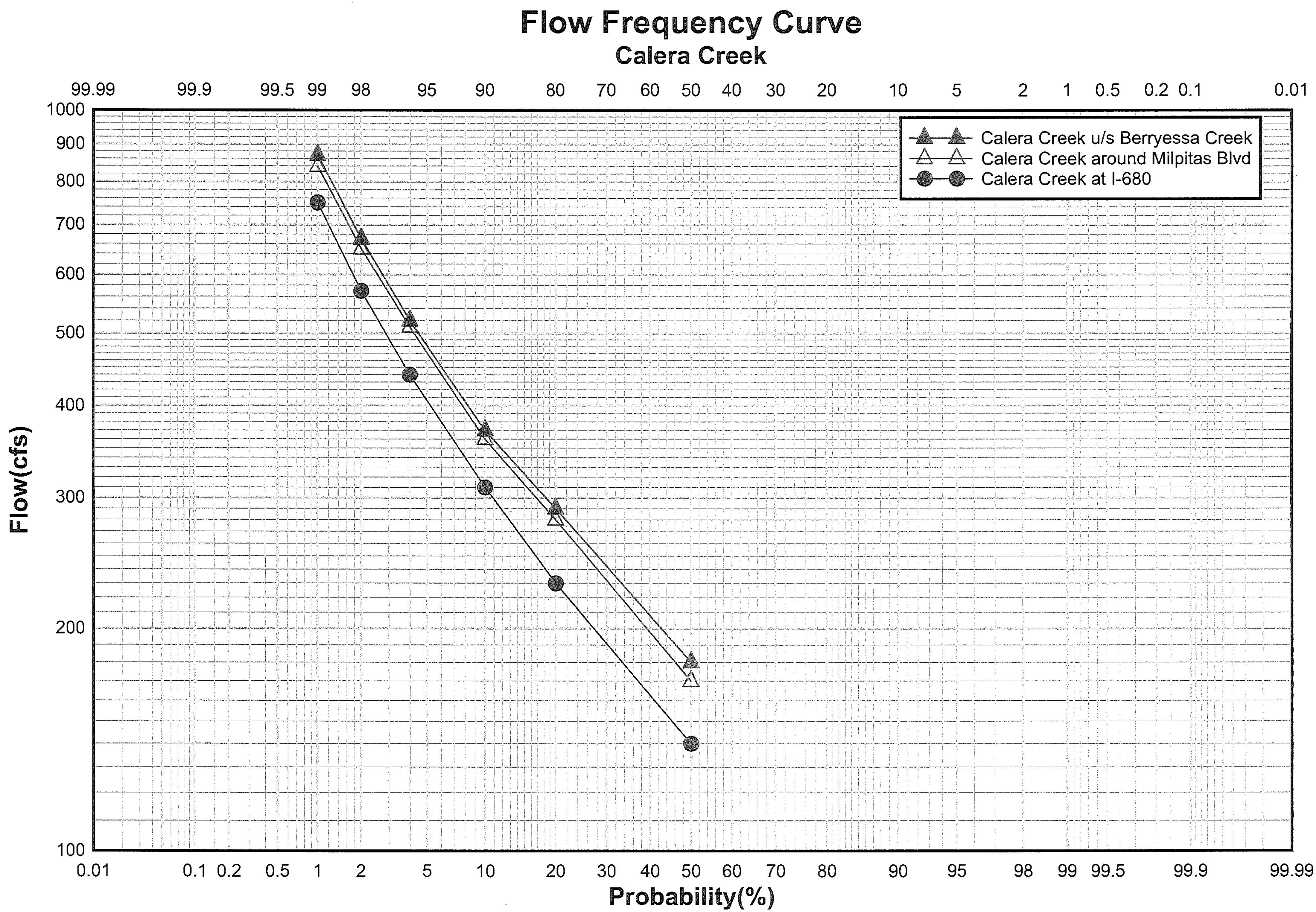
1% hydrographs and flood frequency curves on Calera.

Location	Drainage Area mi^2	2 year cfs	5 year cfs	10 year cfs	25 year cfs	50 year cfs	100 year cfs
Calera Creek at I-680	2.49	140	230	310	440	570	750
Calera Creek around Milpitas Blvd(*)	2.88	170	280	360	510	650	840
Calera Creek u/s Berryessa Creek	2.94	180	290	370	520	670	870

From NHC Model : Berryessa Creek Watershed Hydrology Report by Northwest Hydraulic Consultant Oct. 2006

(*)Around term was used because NHC provide a watershed boundary on a paper not a CAD or GIS file format.

Data Provided by: **Nahm Lee**	**Date:** **4/29/2011**
Reviewed by: **Wendy Chang**	**Date:** **5/2/2011**


Flow Frequency Curve
Calera Creek
Calera Creek u/s Berryessa Creek
Calera Creek around Milpitas Blvd
Calera Creek at I-680
Flow(cfs)
Probability(%)
99.99 99.9 99.5 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.01
1000 900 800 700 600 500 400 300 200 100
0.01 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.9 99.99

Hydrology Hydraulics and Geomorphology Service Request Form

Brief Description of Request:

We need the 1% hydrographs and flood frequency curves for Canoas creek locations:

Requested by: Ed Drury	Extension: 2426	Email: edrury@valleywater.org
Job/Project Title: Future Funding	Job/Project No: 00042037	Date of Request: 4/26/11
Unit No: 411	Task No: 0000	Date Required: ASAP or 5/2/11

Canoas @ SF gage 73 (U/S Almaden Expwy),

@ Sta 14+00 (U/S Nightingale)

@ Sta 85+00 (Hillsdale Ave)

@ Sta 110+00 (Capitol Expwy)

@ Sta 152+00 (Branham Ln)

@ Sta. 214+00 (Blossom Hill Rd.)

@ Sta 243+00 (D/S Calero Ave.)

@ Sta. 265+00 (Santa Teresa Blvd.)

@ Sta. 390+00 (D/S Cottle)

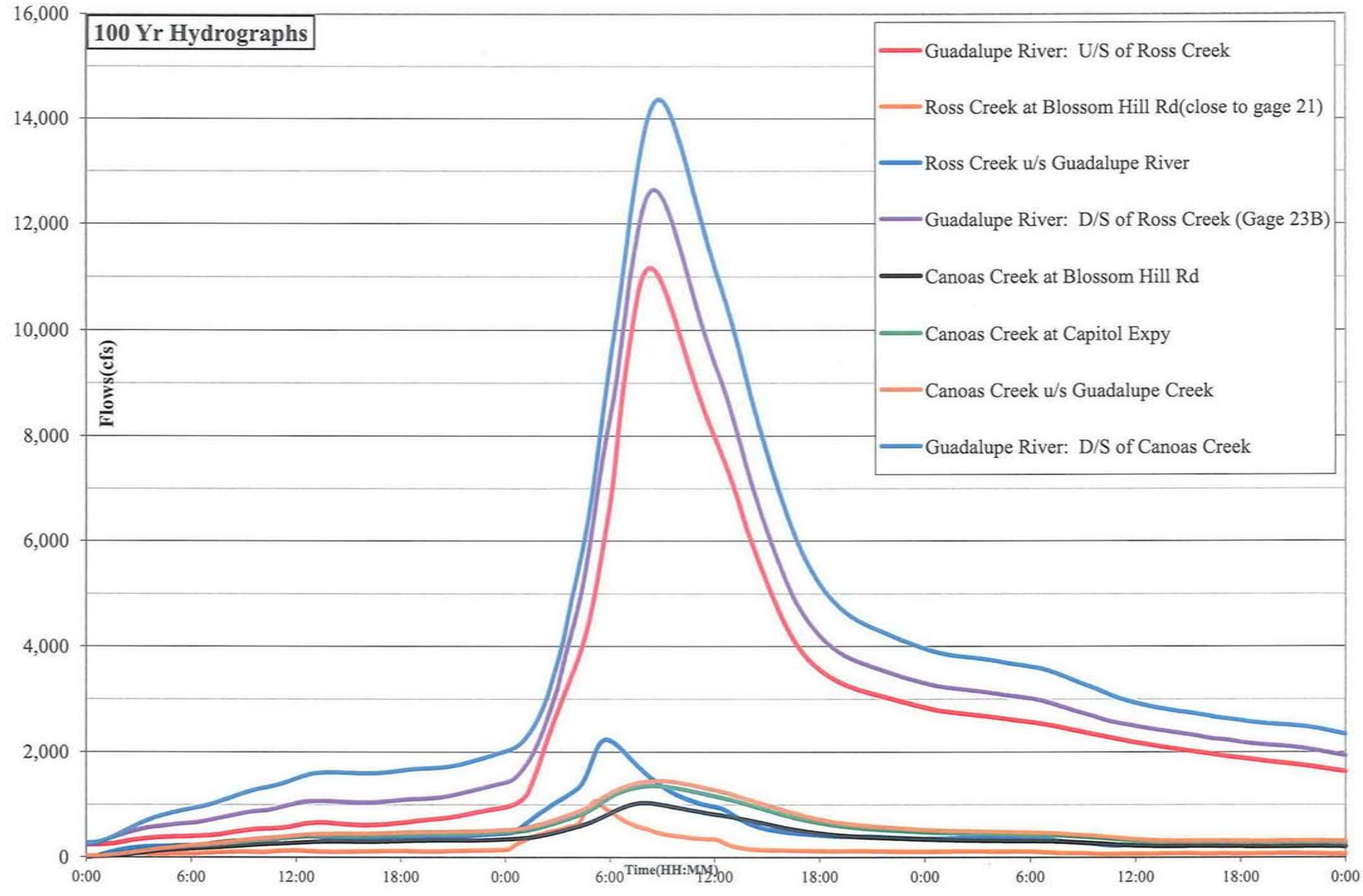
Deliverable(s):

1% hydrographs and flood frequency curves on Canoas creek

Location	Drainage Area mi^2	2 year cfs	5 year cfs	10 year cfs	25 year cfs	50 year cfs	100 year cfs
Canoas Creek at Blossom Hill (close to 215+00)	13.28	390	560	650	790	920	1,000
Canoas Creek at Capitol Express(close to 105+00)	18.08	530	760	880	1,100	1,200	1,400
Canoas Creek at Stream gage 73 (close to 0+00)	19.78	570	810	950	1,100	1,300	1,500

From COE Model: Guadalupe Watershed Hydrological Assessment prepared by U.S. Army Corps of Engineers San Francisco District November 2009

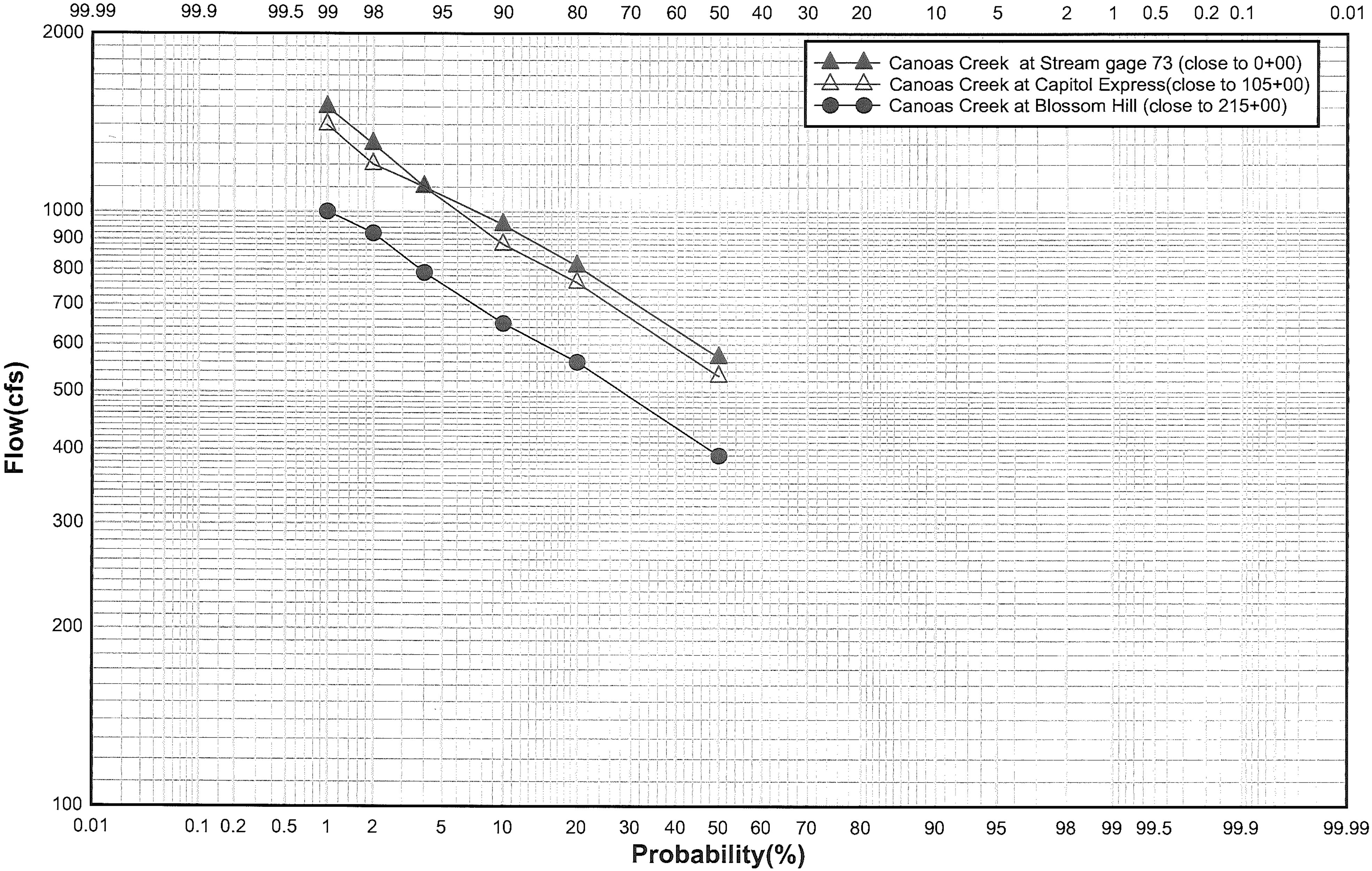
Data Provided by: Nahm Lee	Date: 4/29/2011
Reviewed by: Wendy Chang	Date: 5/2/2011



100 Yr Hydrographs
Flows(cfs)
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
0:00
6:00
12:00
18:00
0:00
6:00
Time(HH:MM)
12:00
18:00
0:00
6:00
12:00
18:00
0:00
Guadalupe River: U/S of Ross Creek
Ross Creek at Blossom Hill Rd(close to gage 21)
Ross Creek u/s Guadalupe River
Guadalupe River: D/S of Ross Creek (Gage 23B)
Canoas Creek at Blossom Hill Rd
Canoas Creek at Capitol Expy
Canoas Creek u/s Guadalupe Creek
Guadalupe River: D/S of Canoas Creek

Flow Frequency Curve

Canoas Creek



Canoas Creek

Location	Stn	Model	LOS (AM)[*1]	FEMA	1976 Grn Bk	Jim Wang[*2]
Cottle Rd	39034	621	621	510	510	490
Santa Teresa Blvd	26519	841		830	830	
Calero Ave	24348	841	841			
Blossom Hill Rd	21407	1,307	1,307	1,400	1,400	1,000
Branham Ln	14942	1,540	1,540			
Capital Expwy	11040	1,540		1,960	2,000	1,400
Hillsdale Ave	8456	1,572	1,572			
	452	1,600	1,600	2,350	2,400	1,500

*1 Based on 1962 Santa Clara County Flood Control and Water Conservation District Calculations of 1962

*2 Based on COE: Guadalupe Watershed Hydrological Assessment prepared by U.S. Army Corps of Egnineers, San Francisco District, November 2009.

Note: Starting water surface elevation is the 10 year flood elevation in Guadalupe Creek at the confluence with Canoas Creek (ie 144.3)

Hydrology Hydraulics and Geomorphology Service Request Form

Brief Description of Request:

Deliverable(s):

Requested by: ROBERT VANDENBERG	Extension: 3025	Email: rvandenberg@valleywater.org
Job/Project Title: FUTURE FUNDING PROJECT	Job/Project No: 0004 2037	Date of Request: 5-10-2011
Unit No: 411	Task No: 0000	Date Required: ASAP

Canoas Creek

I need the creek flow rates for the following events:

Storm: 100-Yr & 10-Yr (if possible without causing too much delay)

I will be using this to review the capacity of the existing creek geometry to find locations where we need to construct upgrades. The location in the creek that I will be investigating is between:

Yellow Book End Sta: 390+00

Location	Drainage Area (mi^2)	10 year cfs	100 year cfs
Canoas Creek at Blossom Hill (close to 215+00)	13.28	650	1,000
Canoas Creek at sta 390+00	6.32	*310	*490

- *** Interpolated value from HMS output (100 yrs: 1030 cfs and 10 yrs 650 cfs are used for interpolation).**

From COE Model Guadalupe Watershed Hydrological Assessment prepared by U.S. Army Coprs of Engineers San Francisco District November 2009

Data Provided by: Nahm Lee	Date: 5/10/2011
Reviewed by: Wendy Chang	Date: 5/10/2011

Hydrology Hydraulics and Geomorphology Service Request Form

Brief Description of Request:

Requested by: Ed Drury	Extension: 2426	Email: edrury@valleywater.org
Job/Project Title: Future Funding	Job/Project No: 00042037	Date of Request: 4/26/11
Unit No: 411	Task No: 0000	Date Required: ASAP or 5/2/11

We need the 1% hydrographs and flood frequency curves for these creeks & locations:

San Tomas Aquino @ Stream Gage 24 (U/S Williams Rd.)

Location	Drainage Area mi2	2.33 year(*) cfs	5 year(*) cfs	10 year cfs	25 year(*) cfs	50 year(*) cfs	100 year cfs
San Tomas Aquino Creek at 120ft upstream from Gage24	16.12	1,500	2,200	2,700	3,300	3,800	4,200
San Tomas Aquino Creek @ Pruneridge Ave	20.20	1,800	2,500	3,100	3,800	4,200	4,600

Note:

Santa Clara Valley Water District West Valley Watershed Hydrology Report January 2008

(*) extrapolated and interpolated by using log Pearson Type III distribution

Flow rates at gage 24 may require detailed analysis because storm drain discharges at Williams rd.

Deliverable(s):

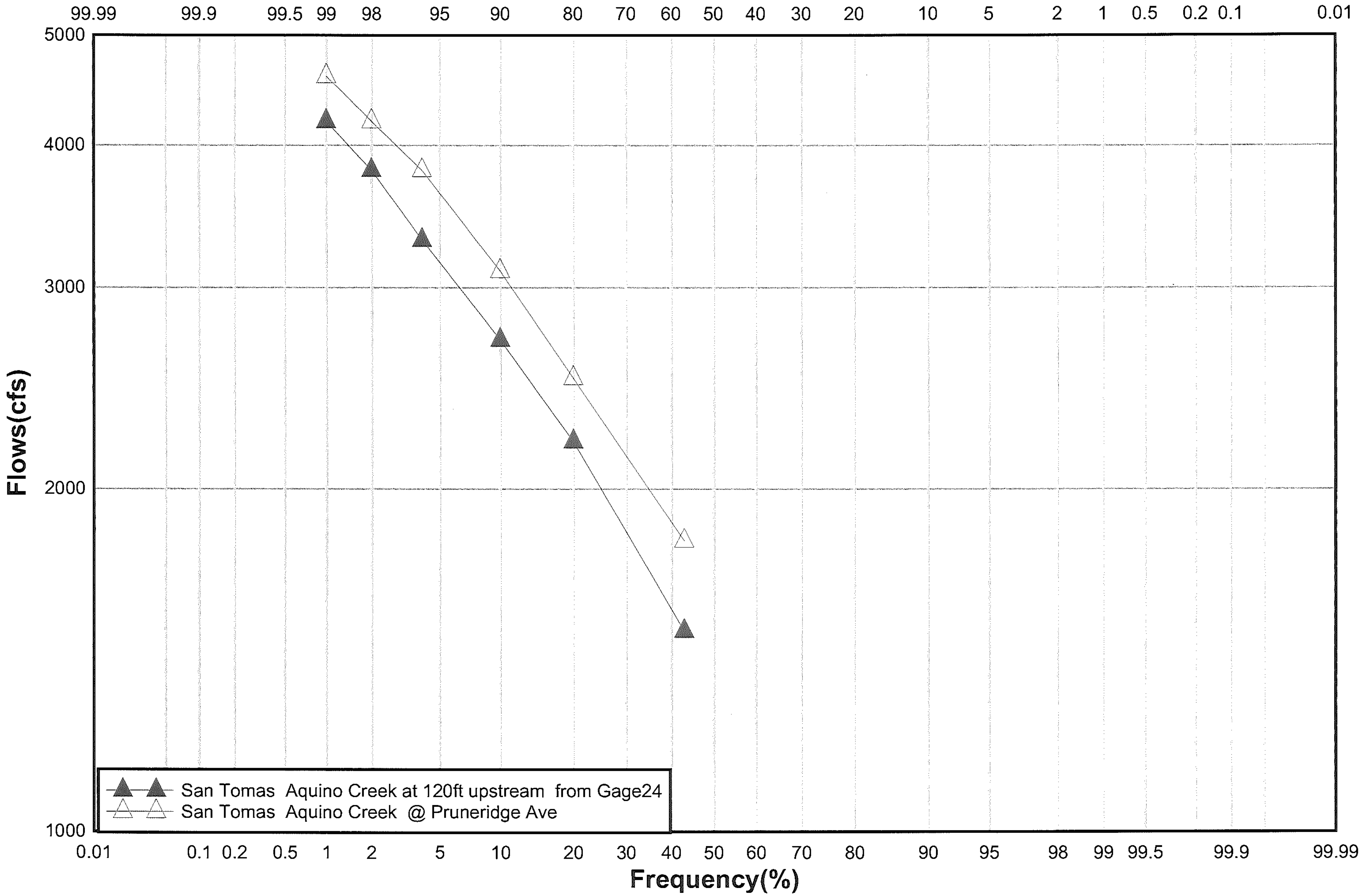
1% hydrographs and flood frequency curves on San Tomas Aquino

Data Provided by: **Nahm Lee**	**Date:** **4/28/2011**
Reviewed by: **Wendy Chang**	**Date:** **4/28/2011**

San Tomas Aquino Creek

Location	Stn	Model		LOS (AM)	FEMA	Green Bk	Hydrol_Unit (Jim Wang)
		PF1	PF2				
Bucknall Rd	52499	2,700	2,700	none			
Kelker Ct	44000						4,200
Williams Rd	43100					4,600	
	39619	3,000	3,000	none			
Steven Creek Bvd	37800				3,820 [1]		
Pruneridge Ave	35100				3,820 [1]	4,900	4,600
Forbes Ave	33031	3,200	3,200	none			
Homestead Rd	31000				3,450 [1]		
El Camino Real	26800				3,610		
Cabrillo Ave	24300				2,920 [1]		4,800
(end RCB)	23250	5,100	5,100	none			
Saratoga Ck (u/s)	22525					5,100	
Saratoga Ck (d/s)	22525	9,100	9,100	none	9,100	9,100	8,800

1 Denotes flow rate reduction due to channel capacity restriction.



99.99
99.9
99.5
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.01
5000
4000
3000
2000
1000
Flows(cfs)
0.01
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.5
99.9
99.99
Frequency(%)
San Tomas Aquino Creek at 120ft upstream from Gage24
San Tomas Aquino Creek @ Pruneridge Ave

Appendix F

Hydraulic Analyses of Selected Candidate Capital Projects

HEC-RAS Model results for Analyzed Creeks:

Alamitos Creek
Canoas Creek
Calera Creek
San Tomas Aquino Creek

HEC-RAS Plan: Imported Plan Profile: FEMA

River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	L. Freebd (ft)	Rqd Additional L. Freebd (ft)	Rqd Additional L. Levee Width (ft)	R. Freebd (ft)	Rqd Additional R. Freebd (ft)	Rqd Additional R. Levee Width (ft)
18740	4750	287	294.05	5.75			5.75		
18590	4750	286	291.76	2.24			7.64		
18400	4750	283	290.92	0.08			0.08		
18132	4750	281	287.42	0.58			11.58	0.00	0.0
17855	4750	278	285.87	2.13			13.63	0.00	0.0
17755	4750	276.5	285.62	2.38			14.38	0.00	0.0
17655	4750	276	285.48	14.52			14.52	0.00	0.0
17422	6750	272.8	284.52	5.48			12.48	0.00	0.0
17222	6750	271.2	283.48	6.52			16.52	0.00	0.0
17012	6750	270.5	282.70	7.30			19.80	0.00	0.0
16812	6750	270	281.53	4.47			20.47	0.00	0.0
16612	6750	268	279.64	2.36			17.36	0.00	0.0
16555	6750	267	278.97	1.03			13.53	0.00	0.0
16361	6750	266	277.59	0.41			11.41	0.00	0.0
16232	6750	265.5	276.90	1.10			9.60	0.00	0.0
16035	6750	265	275.64	2.36			3.36	0.00	0.0
15800	6750	262.5	274.22	1.78			0.48	2.52	15.1
15599	6750	261.5	273.10	6.90			0.40	2.60	15.6
15404	6750	260.5	272.15	12.85			0.35	2.65	15.9
15268	6750	261	271.74	12.26			-0.04	3.04	18.2
15077	6750	258.5	270.66	11.34			0.14	2.86	17.2
14841	6750	257.5	268.87	11.13			0.23	2.77	16.6
14692	6750	257	268.18	13.82			0.07	2.93	17.6
14553	6750	255.5	267.36	14.64			0.44	2.56	15.4
14308	6750	255.5	266.51	12.49			-0.01	3.01	18.1
14229	6750	255	266.17	12.83			0.33	2.67	16.0
14002	6750	252.8	265.52	10.48			0.28	2.72	16.3
13763	7380	250.5	263.63	12.37			1.37	1.63	9.8
13641	7380	250	262.93	9.07			1.07	1.93	11.6
13445	7380	246.5	261.99	10.01			1.01	1.99	11.9
13344	7380	249.5	261.23	8.77			1.27	1.73	10.4
13170	7380	246.5	260.10	11.90			1.40	1.60	9.6
13050	7380	246.5	259.41	12.59			1.09	1.91	11.5
12777	7380	244.5	257.51	12.49			1.49	1.51	9.1
12640	7380	244	256.01	13.99			1.49	1.51	9.1
12420	7380	243	253.88	13.12			1.62	1.38	8.3
12310	7380	240.5	253.63	12.37			1.37	1.63	9.8
12167	7380	241	252.75	7.25			1.75	1.25	7.5
11967	7380	239.5	252.02	7.98			1.98	1.02	6.1
11842	7380	238.5	251.87	8.13			2.13	1.87	11.2
11814	7380	238.1	251.72	8.28			2.28	1.72	10.3

HEC-RAS Plan: Imported Plan Profile: FEMA

River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	L. Freebd (ft)	Rqd Additional L. Freebd (ft)	Rqd Additional L. Levee Width (ft)	R. Freebd (ft)	Rqd Additional R. Freebd (ft)	Rqd Additional R. Levee Width (ft)
11763	7380	238	250.99	1.51			1.51	2.49	14.9
11720	7380	238	250.57	1.93			1.93	2.07	12.4
11673	7380	238	248.66	1.34			4.34	0.00	0.0
11343	7380	237.5	247.05	2.95			2.75	0.25	1.5
11306	7380	235.5	247.02	2.98			1.98	1.02	6.1
11119	7380	235.5	246.48	3.52			1.82	1.18	7.1
10858	7380	233.8	245.60	4.40			0.90	2.10	12.6
10600	7380	232.7	244.06	5.94			0.64	2.36	14.2
10496	7380	232.5	243.36	1.14	1.86	11.2	0.94	2.06	12.4
10350	7380	231.8	242.54	0.96	2.04	12.2	1.06	1.94	11.6
10166	7380	231.3	241.45	1.05	1.95	11.7	1.05	1.95	11.7
9954	7380	228.7	240.12	0.88	2.12	12.7	0.88	2.12	12.7
9687	7380	227.7	238.77	0.23	2.77	16.6	1.03	1.97	11.8
9365	7800	227.5	237.12	1.08	1.92	11.5	1.18	1.82	10.9
9124	7800	226.3	236.23	1.27	1.73	10.4	1.97	1.03	6.2
8938	7800	225	235.77	1.83	1.17	7.0	2.03	0.97	5.8
8843	7800	224.5	234.96	1.84			2.04	0.96	5.8
8660	7800	223	234.56	4.24			1.94	1.06	6.4
8400	7800	222	233.55	5.45			2.45	0.55	3.3
8220	7800	221.2	233.32	-0.52			1.68	1.32	7.9
8028	7800	220	233.19	-3.19			1.61	1.39	8.3
7750	7800	219	231.15	-2.15			2.05	0.95	5.7
7659	7800	219	230.85	-2.35			1.65	1.35	8.1
7559	7800	218	230.18	-1.18			1.32	1.68	10.1
7442	7800	218	229.16	1.84			1.34	1.66	10.0
7225	7800	217	227.32	-1.32			1.68	1.32	7.9
7078	7800	216.5	227.00	-3.00			0.60	2.40	14.4
6810	7800	215.5	226.08	-2.08			0.92	2.08	12.5
6619	7800	214	225.49	-2.49			1.01	1.99	11.9
6427	7800	213	224.76	-1.76			1.24	1.76	10.6
6306	7800	213.2	224.12	-2.92			1.38	1.62	9.7
6200	7800	212.3	223.05	-2.75			0.95	2.05	12.3
5985	7800	211	220.64	-0.64			1.36	1.64	9.8
5787	7800	210	220.04	-0.04			0.96	2.04	12.2
5592	7800	208.8	219.32	-2.32			0.18	2.82	16.9
5503	7800	207	219.32	-1.32			-2.02		
5403	7800	208	219.19	-1.19			-1.19		
5307	7800	206.5	218.09	0.61			-1.59		
5157	7800	205.8	217.71	-1.71			-1.71		
5020	7800	204.5	217.14	-1.74			-0.64		
4900	7800	204	216.27	-0.27			-1.27		

HEC-RAS Plan: Imported Plan Profile: FEMA

River Sta	Q Total	Min Ch El	W.S. Elev	L. Freebd	Rqd Additional L. Freebd	Rqd Additional L. Levee Width	R. Freebd	Rqd Additional R. Freebd	Rqd Additional R. Levee Width
	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
4805	7800	205	215.65	-1.15			-1.25		
4629	7800	204.2	214.79	-1.49			-0.79	3.79	22.7
4464	7800	202.6	213.17	-0.17			-0.37	3.37	20.2
4343	7800	201.4	212.22	0.58			0.28	2.72	16.3
4229	7800	201.8	211.47	0.53			0.53		
4228	7800	201.8	210.84	1.16			1.16		
4225	7800	201.8	210.27	1.73			1.73		
4222	7800	201.8	209.14	2.86			2.86		
4166	7800	192.5	197.82	14.18			14.18		
4022	8860	192	205.89	5.61			5.11		
3920	8860	192	204.88	3.12			3.12		
3889.5	Bridge								
3859	8860	192	204.73	3.27			3.27		
3810	8860	192	204.64	4.36			3.86		
3609	8860	191.5	204.23	7.97			2.77		
3383	8860	191.2	203.75	5.75			3.65		
3182	8860	191	203.47	5.33			4.53		
2963	8860	190.6	202.71	3.89			2.99		
2779	8860	190.2	202.24	5.76			2.36		
2553	8860	190	201.41	4.59			4.39		
2331	8860	189.5	200.62	4.88			3.38		
2234	8860	189.5	198.37	6.73			7.63		

- Denotes Levee
- Denotes Bridge

Freeboard ~ 3

HEC-RAS Plan: Comparison_0 River: Calera Reach: 1 Profile: 880 cfs

River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Fr #	L. Levee Frbrd	R. Levee Frbrd
	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(ft)	(ft)
6455	880	88.4	94.5		95.6	0.00723	8.3	105.7	26.4	0.7		
6355	880	86.3	92.7	92.7	94.5	0.01446	10.9	81.1	22.3	1.0		
6255	880	83.8	90.2	90.2	92.1	0.01446	10.9	81.1	22.3	1.0		
6155	880	81.4	87.8	87.8	89.6	0.01446	10.9	81.1	22.3	1.0		
6055	880	78.9	85.3	85.3	87.2	0.01446	10.9	81.1	22.3	1.0		
5955	880	76.5	82.9	82.9	84.7	0.01446	10.9	81.1	22.3	1.0		
5855	880	74.0	80.5	80.5	82.3	0.01445	10.9	81.1	22.3	1.0		
5755	880	71.6	78.0	78.0	79.8	0.01445	10.9	81.1	22.3	1.0		
5655	880	69.1	75.6	75.6	77.4	0.01445	10.9	81.1	22.3	1.0		
5555	880	66.7	73.1	73.1	74.9	0.01444	10.9	81.1	22.3	1.0		
5455	880	64.3	70.7	70.7	72.5	0.01442	10.8	81.2	22.3	1.0		
5386	880	57.8	67.1	63.0	67.4	0.00106	4.1	246.4	135.0	0.3		
5380 Culvert												
5374	880	57.8	63.2	62.3	64.1	0.00669	7.7	114.0	31.8	0.7	3.88	3.88
5355	880	57.8	62.3	62.3	63.9	0.01353	10.0	88.0	28.4	1.0		
5350	880	57.6	61.9	61.9	63.2	0.01363	9.3	94.9	35.6	1.0		
5345	880	57.3	61.4	61.4	62.6	0.01406	8.6	102.2	44.4	1.0		
5340	880	57.1	61.1	61.1	62.0	0.01466	8.0	110.6	56.2	1.0		
5335	880	56.9	60.7	60.7	61.5	0.01580	7.3	121.1	75.1	1.0		
5330	880	56.7	60.2	60.2	60.9	0.01620	6.9	127.4	87.1	1.0		
5325	880	56.5	60.3	59.7	60.6	0.00489	4.5	195.8	103.8	0.6	3.47	3.47
5255	880	55.0	60.4	58.2	60.4	0.00069	2.4	368.8	116.4	0.2	3.47	3.47
5196	880	54.5	60.0	60.0	60.3	0.00758	4.5	194.1	97.7	0.6	3.50	3.50
5063	880	52.8	57.0	57.0	57.9	0.03677	7.5	117.6	92.6	1.0	6.52	6.52
4903	880	50.6	53.5	52.7	53.8	0.00874	4.5	196.9	96.7	0.6	4.55	4.55
4717	880	46.2	50.4	50.4	51.1	0.02787	6.3	139.1	94.0	0.9	3.46	3.46
4548	880	45.1	47.9	47.3	48.2	0.01075	4.8	185.3	100.2	0.6	3.46	3.46
4460	880	44.1	46.1	46.1	46.8	0.02678	6.5	135.3	101.9	1.0	3.50	3.50
4358	880	40.4	45.3	44.0	45.5	0.00412	3.4	261.7	107.1	0.4	3.74	3.74
4299	880	39.2	45.2	41.7	45.3	0.00115	3.2	276.4	57.8	0.3	3.74	3.74
4276	880	39.0	44.9	42.2	45.3	0.00028	5.2	168.9	63.7	0.4	3.74	3.74
4182 Culvert												

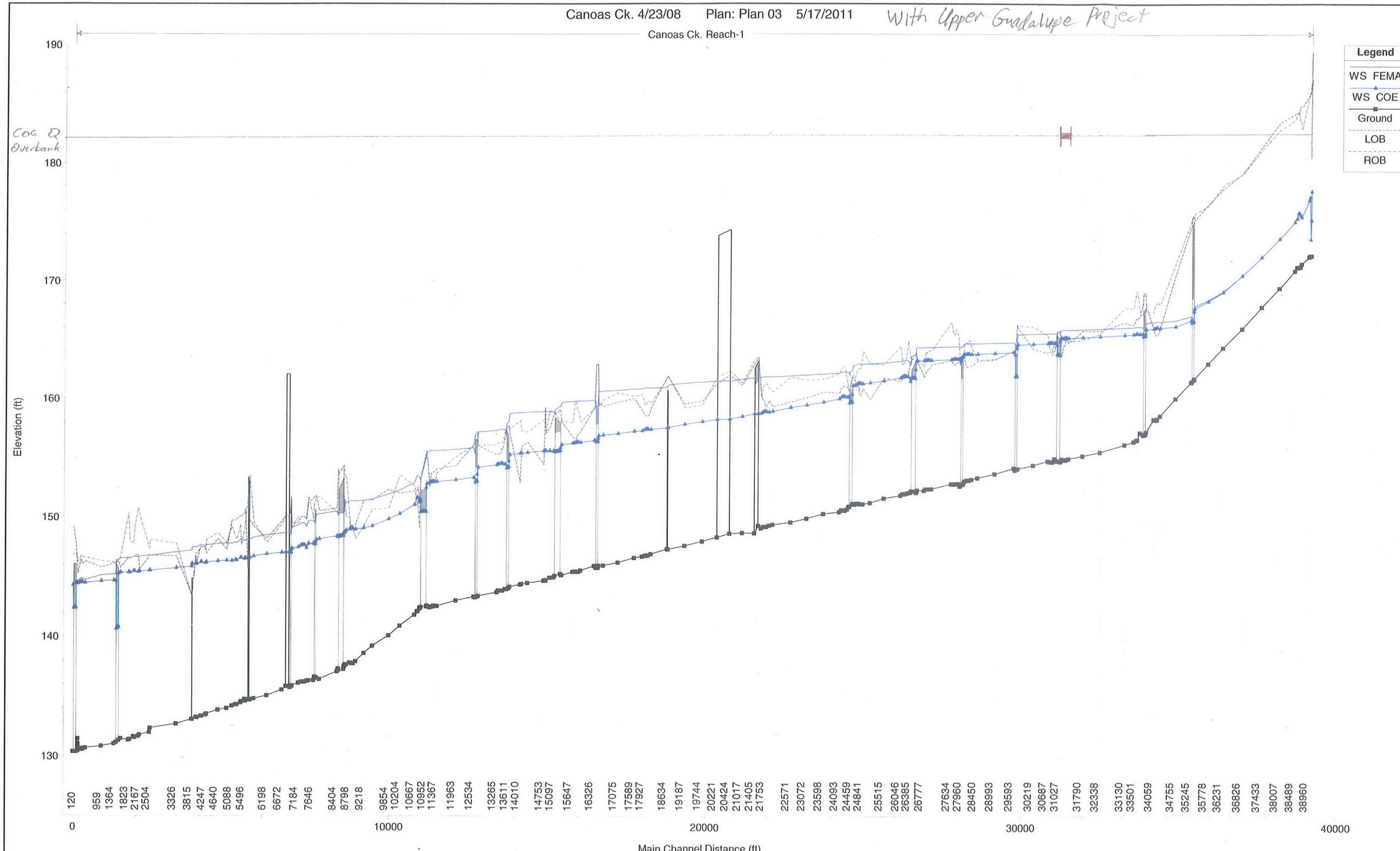
4088	880	38.3	41.2	40.9	42.2	0.01661	7.4	113.9	84.2	0.8	3.94	3.94	
4011	880	35.0	40.7	40.0	41.1	0.00856	5.8	157.9	104.4	0.6	3.94	3.94	
3734	880	31.6	36.7	36.7	37.4	0.02443	7.7	159.2	104.0	0.8	3.49	3.49	
3351	880	26.6	32.7	31.1	32.9	0.00440	3.1	283.0	105.4	0.3	3.32	3.32	
3186	880	25.8	32.5	29.5	32.6	0.00068	2.3	384.1	110.2	0.2	3.29	3.29	
3145	880	25.0	32.3	29.3	32.6	0.00161	4.2	210.8	70.2	0.4	3.30	3.30	Lowest
3128	880	25.7	30.1	30.1	32.3	0.00351	11.9	74.0	16.9	1.0	3.37	3.37	
3126.07	880	24.9	29.3	29.3	31.3	0.00313	11.5	76.7	18.8	1.0	3.82	3.82	
3124.15	880	24.2	28.4	28.4	30.3	0.00290	11.1	79.0	20.5	1.0	4.26	4.26	
3122.23	880	23.4	27.5	27.5	29.4	0.00275	10.9	81.0	22.1	1.0	4.71	4.71	
3120.3	880	22.6	26.7	26.7	28.4	0.00266	10.6	82.7	23.5	1.0	5.14	5.14	
3118.38	880	21.8	25.8	25.8	27.5	0.00260	10.4	84.3	24.9	1.0	5.56	5.56	
3116.46	880	21.0	25.0	25.0	26.6	0.00257	10.3	85.5	26.1	1.0	5.99	5.99	
3114.53	880	20.2	24.1	24.1	25.7	0.00253	10.1	86.9	27.3	1.0	6.40	6.40	
3112.61	880	19.4	23.8	23.3	24.9	0.00162	8.6	102.6	29.8	0.8	6.31	6.31	
3110.69	880	18.7	24.2	22.5	24.8	0.00065	6.1	144.1	34.8	0.5	5.50	5.50	
3108.76	880	17.9	24.3	21.6	24.7	0.00034	4.8	184.3	39.5	0.4	4.92	4.92	
3106.84	880	17.1	24.4	20.8	24.7	0.00019	3.9	227.5	44.5	0.3	4.41	4.41	
3104.92	880	16.3	24.5	20.0	24.6	0.00012	3.2	274.4	49.6	0.2	3.94	3.94	
3103	880	15.5	24.5	19.2	24.6	0.00045	2.7	326.5	55.0	0.2	3.49	3.49	
3094	880	15.3	24.3	19.1	24.6	0.00073	4.3	204.3	59.3	0.3	3.69		
2994	880	15.3	24.4	19.5	24.5	0.00059	2.9	327.0	88.0	0.2	3.64	3.64	

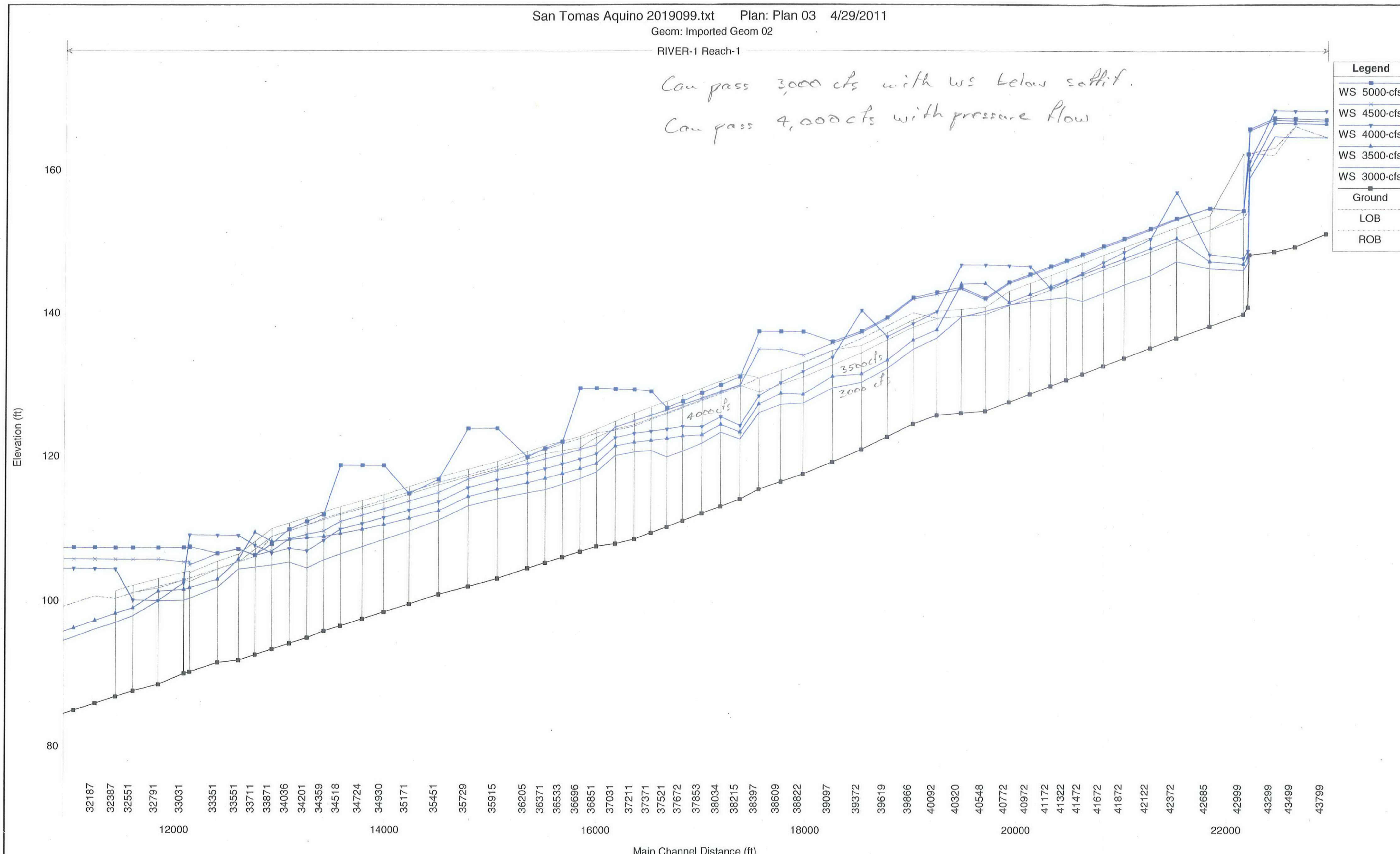
4088	880	38.3	41.2	40.9	42.2	0.01661	7.4	113.9	84.2	0.8	3.94	3.94	
4011	880	35.0	40.7	40.0	41.1	0.00856	5.8	157.9	104.4	0.6	3.94	3.94	
3734	880	31.6	36.7	36.7	37.4	0.02443	7.7	159.2	104.0	0.8	3.49	3.49	
3351	880	26.6	32.7	31.1	32.9	0.00440	3.1	283.0	105.4	0.3	3.32	3.32	
3186	880	25.8	32.5	29.5	32.6	0.00068	2.3	384.1	110.2	0.2	3.29	3.29	
3145	880	25.0	32.3	29.3	32.6	0.00161	4.2	210.8	70.2	0.4	3.30	3.30	Correct
3128	880	25.7	30.1	30.1	32.3	0.00351	11.9	74.0	16.9	1.0	3.37	3.37	
3126.07	880	24.9	29.3	29.3	31.3	0.00313	11.5	76.7	18.8	1.0	3.82	3.82	
3124.15	880	24.2	28.4	28.4	30.3	0.00290	11.1	79.0	20.5	1.0	4.26	4.26	
3122.23	880	23.4	27.5	27.5	29.4	0.00275	10.9	81.0	22.1	1.0	4.71	4.71	
3120.3	880	22.6	26.7	26.7	28.4	0.00266	10.6	82.7	23.5	1.0	5.14	5.14	
3118.38	880	21.8	25.8	25.8	27.5	0.00260	10.4	84.3	24.9	1.0	5.56	5.56	
3116.46	880	21.0	25.0	25.0	26.6	0.00257	10.3	85.5	26.1	1.0	5.99	5.99	
3114.53	880	20.2	24.1	24.1	25.7	0.00253	10.1	86.9	27.3	1.0	6.40	6.40	
3112.61	880	19.4	23.8	23.3	24.9	0.00162	8.6	102.6	29.8	0.8	6.31	6.31	
3110.69	880	18.7	24.2	22.5	24.8	0.00065	6.1	144.1	34.8	0.5	5.50	5.50	
3108.76	880	17.9	24.3	21.6	24.7	0.00034	4.8	184.3	39.5	0.4	4.92	4.92	
3106.84	880	17.1	24.4	20.8	24.7	0.00019	3.9	227.5	44.5	0.3	4.41	4.41	
3104.92	880	16.3	24.5	20.0	24.6	0.00012	3.2	274.4	49.6	0.2	3.94	3.94	
3103	880	15.5	24.5	19.2	24.6	0.00045	2.7	326.5	55.0	0.2	3.49	3.49	
3094	880	15.3	24.3	19.1	24.6	0.00073	4.3	204.3	59.3	0.3	3.69		
2994	880	15.3	24.4	19.5	24.5	0.00059	2.9	327.0	88.0	0.2	3.64	3.64	

Freeboard > 3

HEC-RAS Plan: Comparison_0 River: Calera Reach: 1 Profile: 880 cfs

River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Fr #	L. Levee Frbrd	R. Levee Frbrd
	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(ft)	(ft)
6455	880	88.4	94.5		95.6	0.00723	8.3	105.7	26.4	0.7		
6355	880	86.3	92.7	92.7	94.5	0.01446	10.9	81.1	22.3	1.0		
6255	880	83.8	90.2	90.2	92.1	0.01446	10.9	81.1	22.3	1.0		
6155	880	81.4	87.8	87.8	89.6	0.01446	10.9	81.1	22.3	1.0		
6055	880	78.9	85.3	85.3	87.2	0.01446	10.9	81.1	22.3	1.0		
5955	880	76.5	82.9	82.9	84.7	0.01446	10.9	81.1	22.3	1.0		
5855	880	74.0	80.5	80.5	82.3	0.01445	10.9	81.1	22.3	1.0		
5755	880	71.6	78.0	78.0	79.8	0.01445	10.9	81.1	22.3	1.0		
5655	880	69.1	75.6	75.6	77.4	0.01445	10.9	81.1	22.3	1.0		
5555	880	66.7	73.1	73.1	74.9	0.01444	10.9	81.1	22.3	1.0		
5455	880	64.3	70.7	70.7	72.5	0.01442	10.8	81.2	22.3	1.0		
5386	880	57.8	67.1	63.0	67.4	0.00106	4.1	246.4	135.0	0.3		
5380 Culvert												
5374	880	57.8	63.2	62.3	64.1	0.00669	7.7	114.0	31.8	0.7	3.88	3.88
5355	880	57.8	62.3	62.3	63.9	0.01353	10.0	88.0	28.4	1.0		
5350	880	57.6	61.9	61.9	63.2	0.01363	9.3	94.9	35.6	1.0		
5345	880	57.3	61.4	61.4	62.6	0.01406	8.6	102.2	44.4	1.0		
5340	880	57.1	61.1	61.1	62.0	0.01466	8.0	110.6	56.2	1.0		
5335	880	56.9	60.7	60.7	61.5	0.01580	7.3	121.1	75.1	1.0		
5330	880	56.7	60.2	60.2	60.9	0.01620	6.9	127.4	87.1	1.0		
5325	880	56.5	60.3	59.7	60.6	0.00489	4.5	195.8	103.8	0.6	3.47	3.47
5255	880	55.0	60.4	58.2	60.4	0.00069	2.4	368.8	116.4	0.2	3.47	3.47
5196	880	54.5	60.0	60.0	60.3	0.00758	4.5	194.1	97.7	0.6	3.50	3.50
5063	880	52.8	57.0	57.0	57.9	0.03677	7.5	117.6	92.6	1.0	6.52	6.52
4903	880	50.6	53.5	52.7	53.8	0.00874	4.5	196.9	96.7	0.6	4.55	4.55
4717	880	46.2	50.4	50.4	51.1	0.02787	6.3	139.1	94.0	0.9	3.46	3.46
4548	880	45.1	47.9	47.3	48.2	0.01075	4.8	185.3	100.2	0.6	3.46	3.46
4460	880	44.1	46.1	46.1	46.8	0.02678	6.5	135.3	101.9	1.0	3.50	3.50
4358	880	40.4	45.3	44.0	45.5	0.00412	3.4	261.7	107.1	0.4	3.74	3.74
4299	880	39.2	45.2	41.7	45.3	0.00115	3.2	276.4	57.8	0.3	3.74	3.74
4276	880	39.0	44.9	42.2	45.3	0.00028	5.2	168.9	63.7	0.4	3.74	3.74
4182 Culvert												


Canoas Ck. 4/23/08 Plan: Plan 03 5/17/2011
With Upper Guadalupe Project
Canoas Ck. Reach-1
Legend
WS FEMA
WS COE
Ground
LOB
ROB
COE Q Overbank
Elevation (ft)
130
140
150
160
170
180
190
120
959
1364
1823
2167
2504
3326
3815
4247
4640
5088
5496
6198
6672
7184
7646
8404
8798
9218
9854
10204
10667
10952
11367
11963
12534
13265
13611
14010
14753
15097
15647
16326
17075
17589
17927
18634
19187
19744
20221
20424
21017
21405
21753
22571
23072
23598
24093
24459
24841
25515
26046
26385
26777
27634
27960
28450
28993
29593
30219
30687
31027
31790
32338
33130
33501
34059
34755
35245
35778
36231
36826
37433
38007
38489
38960
0
10000
20000
30000
40000
Main Channel Distance (ft)



San Tomas Aquino 2019099.txt Plan: Plan 03 4/29/2011
Geom: Imported Geom 02
RIVER-1 Reach-1
Can pass 3,000 cfs with ws below soffit.
Can pass 4,000 cfs with pressure flow
Legend
WS 5000-cfs
WS 4500-cfs
WS 4000-cfs
WS 3500-cfs
WS 3000-cfs
Ground
LOB
ROB
Elevation (ft)
80
100
120
140
160
4000 cfs
3500 cfs
3000 cfs
32187 32387 32551 32791 33031 33351 33551 33711 33871 34036 34201 34359 34518 34724 34930 35171 35451 35729 35915 36205 36371 36533 36696 36851 37031 37211 37371 37521 37672 37853 38034 38215 38397 38609 38822 39097 39372 39619 39866 40092 40320 40548 40772 40972 41172 41322 41472 41672 41872 42122 42372 42685 42999 43299 43499 43799
12000
14000
16000
18000
20000
22000
Main Channel Distance (ft)

Appendix G

Average Annual Damages - Calculation Methodology

Excerpt from Chapter 2 of 1983 SCVWD Waterways Planning Study

3. <u>Average Annual Damages</u> - The curve in Figure 7A illustrates the relationship between flood damage and probability of exceedance. The area under the curve is the <u>average annual flood damage</u> in dollars per year.

When evaluating the effectiveness of various flood protection plans there wll generally be residual flood damages for each alternative, due to flood events larger than the design event. The residual damage is the area under the damage-frequency curve after the selected alternative is implemented. The reduction in the annual flood damage potential is the principal benefit realized if the flood control measure is constructed. The <u>average annual benefit</u> is illustrated in Figure 7B as the areas between the pre-project damage frequency curve and the post-project frequency curve.

The damage-frequency curve is usually prepared by estimating damages for three, four or more events. Because of the preliminary nature of the present study there is only one point (1% damages and frequency of flooding) which can be used.

When the District constructs a flood control project the principal benefit is a reduction in the annual flood damage potential. The average annual benefit from construction of a 1% capacity project will be the area shown in Figure 7C. This average annual benefit is estimated as the area under the triangular section multiplied by a correction factor, CF:

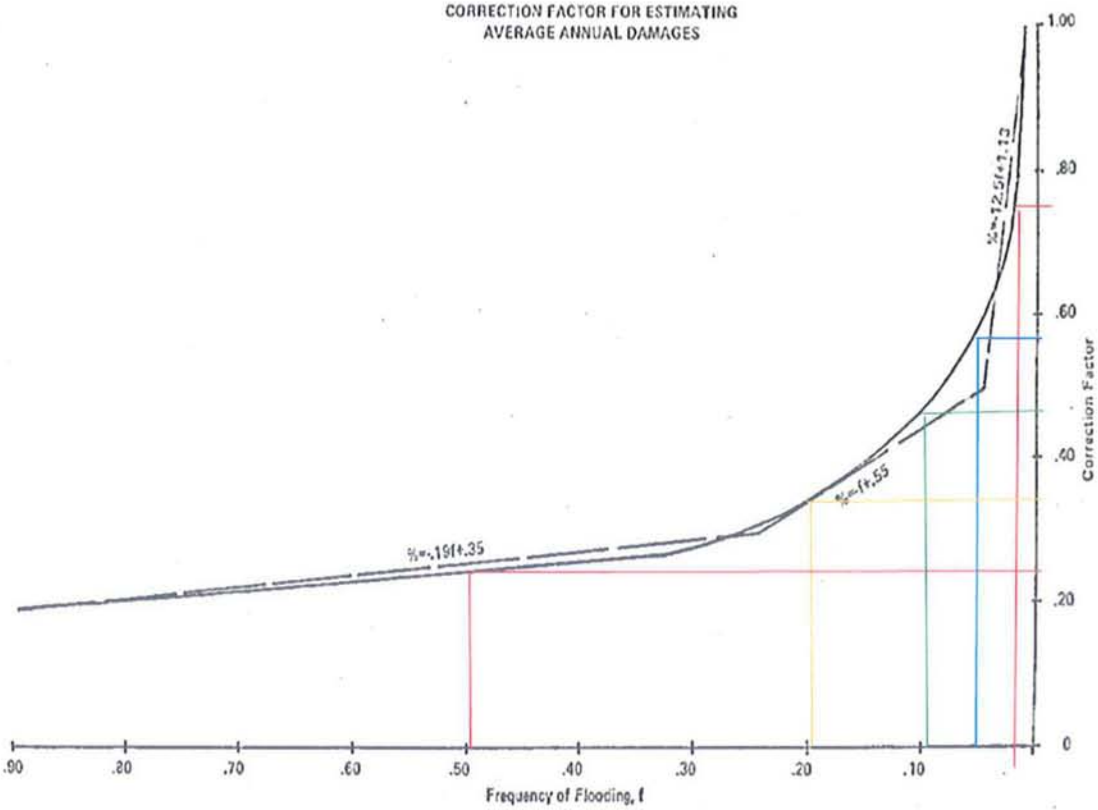
Average Annual Benefit =

$$\frac{(\text{Frequency of flooding} + .01)}{2} \text{ X (1\% Damages) X C + (1\% Damages X .01)}$$

The correction factor, CF, has been developed to adjust the triangular area such that approximates move closely the area under a typical damage curve. For a channel which floods infrequently the triangular area calculation is a fair approximation of the actual damage curve so the CF is very nearly 1.0. The variation of the CF with the frequency of flooding is plotted in Figure 7D.

FIGURE 7D

CORRECTION FACTOR FOR ESTIMATING
AVERAGE ANNUAL DAMAGES



Appendix H

Revised CIP Scoring Sheets for Updated Flood Capital Reaches

CIP scores were revised or created for three candidate creek reaches.

Alamitos Creek
Calera Creek
Canoas Creek

Scores for other reaches that were previously scored are listed separately in a summary table.
All scores can be seen in Table 1

Santa Clara Valley Water District

MEMORANDUM

TO:	Chris Elias DOO West and Guadalupe Watershed Division	**FROM**:	Sara Duckler Senior Engineer
SUBJECT:	CIP Priority Score, Alamitos Creek	**DATE**:	September 7, 2011

This memorandum requests your approval of a new Capital Improvement Plan (CIP) priority score for the reach of Alamitos Creek from Lake Almaden to upstream of Harry Road. The CIP priority ranking scoring sheet (attached) uses established criteria and weights to develop a priority score for potential capital projects. This reach had been previously scored at 19 in the CIP, but updated information increases the score to 51. The reason for this increase is described in this memorandum.

The reach was constructed by the district in the early 1980's to provide 1% flood protection to the surrounding neighborhood. However, the project did not meet subsequently-published FEMA standards and the neighborhood was later mapped into a FEMA-regulatory floodplain. Rehabilitation of this reach is being considered as a potential capital project.

According to district records, 1% damages for the reach were previously assumed to be zero, resulting in a low CIP priority score. Analyzing for an estimated return period of 95 years, which accounts for the existing high level of protection, significantly changes the CIP priority score.

The updated analyses were reflected in the scoring as follows:

> The project would restore existing watershed infrastructure to its intended 1% level of flood protection. Without the proposed work, the impact of a flood would be 'medium' (with about 1,100 parcels, primarily residential, subject to relatively shallow flooding of up to 1.5' depth) and the probability of a flood would be 'low'
>
> Estimated average annual flood damages for the 420 acres of developed land are $1,000,000 based on an analysis of the adjacent floodplain as mapped by FEMA in the 2009 published Digital Flood Insurance Rate Map (DFIRM), as shown in the attached map. The economic analysis was performed using FEMA's HAZUS flood damage estimator software in 2011 and an estimated return period of 95 years;
>
> All other items were scored based on likely project features or the pre-existing rating, consistent with other scoring efforts in the CIP rating system.

Please review the new score and sign below to indicate your acceptance. With your approval, the new score will be incorporated into the CIP record. It does not establish whether or not the project will be pursued.

Concurrence with updated CIP priority score:

____
Chris Elias
Deputy Operating Officer
West and Guadalupe Watersheds Division

Cc: M. Richardson, B. Redmond, L. Jaimes, A. Mendiola
Attachments: CIP Priority Ranking Score Sheet, Alamitos Creek
Map of flooding and HAZUS analysis area, Alamitos Creek

FY 12 FLOOD PROTECTION PROJECTS
Priority Ranking Criteria

PRIORITY SCORE = 44
RAW SCORE = 30

XXXXXXXX Calera Ck, Escuela to US of Park Victoria

PRIMARY OBJECTIVE (60%)

Flood Protection (E 3) — Impact = M ; Probability = L — 25.88

A [M-] Project restores existing watershed infrastructure to its intended level of flood protection.

B Project balances environmental quality and protection from flooding in a cost effective manner.

Average annual flood damages (13.5 pts.)	900	$K
Size of developed area (2 pts.)	230	Acres
Upstream and downstream improvements (1.3 pts.)	N	Y/N
Rehabilitated reach (1.8 pts.)	N	Y/N
Proposed development (1 pt.)	72	Acres
Downstream reach (1.3 pts.)	Y	Y/N
Maintenance cost (1.4 pts.)	0	per Mile
Multipurpose use (1.5 pts.)	0	Miles
Flood insurance costs (1.6 pts.)		$
Historical flood areas (1.6 pts.)		Acres

SOCIAL FACTORS (10%)

Positive Interaction (E 4) - Check all that apply — 2.00

- [ ] With the Community
- [ ] With other agencies

Good Neighbor (E 4) - Check all that apply

- [X] Graffiti removal or Prevention Features
- [ ] Trash removal features (vortex weirs)
- [ ] Improves esthetics of project location

ENVIRONMENTAL FACTORS (15%)

Ecological Function (E 3.2) - Check all that apply — 2.50

- [ ] Fish Barrier Removal / Structural improvement to fish habitat
- [X] Riparian Habitat (planting, setback or protect in place)
- [ ] SRA Plantings or Improved water temperature
- [ ] Upland Habitat Protection/Preservation
- [ ] Wetland Habitat Protection/Preservation
- [ ] Hardscape Reduction

Water Quality (E 3.2) - Check all that apply

- [ ] Storm Water Treatment
- [ ] TMDL Improvements
- [ ] Provides opportunity for recharge

Trails & Open Space (E3.3) - Check all that apply

- [X] Trail friendly features
- [ ] Provides/Improves Bicycle Commute Route
- [ ] Open Space Protection / Preservation

ECONOMIC FACTORS (15%)

Funding Available from Other Agencies - Check One — 0.00

- [ ] Over 50% of project costs available from other agencies
- [ ] 26% to 50% of project costs available from other agencies
- [ ] Up to 25% of project costs available from other agencies

Santa Clara Valley Water District

MEMORANDUM

TO: Chris Elias
DOO, West and Guadalupe Watershed Division

FROM: Sara Duckler
Senior Engineer

SUBJECT: CIP Priority Score, Canoas Creek

DATE: September 7, 2011

This memorandum requests your approval of a new Capital Improvement Plan (CIP) priority score for the reach of Canoas Creek from Guadalupe River to Cottle Road. The attached priority ranking scoring sheet uses established criteria and weights to develop a priority score for potential capital projects.

This reach had been previously scored at 38. An updated score of 15 has been developed. The following information is provided to support the recommended score.

The reach was constructed in the mid 1970's to provide flood protection to the surrounding neighborhood. A project to rehabilitate the reach has been considered.

Based on previously published flows (FEMA 1998 and SCVWD 1976), district records previously indicated that Canoas Creek would produce a 1% floodplain covering nearly 10,000 parcels with shallow flooding of less than one foot depth. Because of the shallow depth, FEMA does not require flood insurance in most of this area. However, the large extent of flooding and associated damages warranted a close look at Canoas by the Future Funding engineering team as a potential flood protection project.

Recently, a 1% flow rate was published for Canoas Creek by the Corps of Engineers (2009). Of the three published flow rates (1976, 1998, and 2009), district technical and management staff (Jim Wang, Engineering Unit Manager – Hydrology, Hydraulics and Geomorphology; and Liang Lee, DOO Coyote and Pajaro Watersheds Division) have advised the Future Funding engineering team that the 2009 Corps flow represents the best available information. See Table 1, below, for a comparison between published 1% flow rates.

Location	**SCVWD 1976 Green Book**	**FEMA (1998)**	**COE (2009)**
Cottle Rd	510	510	490
Santa Teresa Blvd	830	830	
Blossom Hill Rd	1,400	1,400	1,000
Capital Expwy	2,000	1,960	1,400
Confluence	2,400	2,350	1,500

Table 1 – Published 1% Flow Rates, Canoas Creek.

The COE (2009) flows differ significantly from and are as much as 40% lower than the SCVWD Green Book or FEMA flows.

The Future Funding engineering team analyzed all three published 1% flow rates using the most recent HEC-RAS model for Canoas Creek. The District HEC-RAS model for Canoas Creek was modified to include culvert improvements at Almaden Expressway and Nightingale Avenue; these improvements will be part of the Upper Guadalupe Project, anticipated to be completed by 2016. The 1976 and 1998 flow rates corroborated the previously-identified widespread but shallow flooding. In contrast, there would be very little overbanking under the COE (2009) 1% flow rates.

Conclusion

Although widespread shallow flooding is indicated by the 1976 SCVWD/ 1998 FEMA 1% flows, the 2009 COE 1% flows indicate little if any flooding would occur along Canoas Creek, particularly after the Upper Guadalupe flood protection project is completed. The difference between which flow is used strongly influences the CIP priority score.

The Future Funding engineering team has been advised that the 2009 COE analysis represents the best available data.

Using the most up-to-date information, the CIP priority score for this project has been updated. The attached priority ranking score sheet provides the basis for the updated score.

With your approval, the new score will be incorporated into the CIP record. It does not establish whether or not the project will be pursued.

Concurrence with CIP priority score:

____

Chris Elias
Deputy Operating Officer
West and Guadalupe Watersheds Divisions

Cc: M. Richardson, B. Redmond, L. Jaimes, A. Mendiola

Attachment: CIP Priority Score sheet - Canoas

FY 12 FLOOD PROTECTION PROJECTS
Priority Ranking Criteria

PRIORITY SCORE = **15**

23C40248 Canoas Creek - Guadalupe River to Cottle Road — RAW SCORE = 10

PRIMARY OBJECTIVE (60%)

Flood Protection (E 3) — Impact = L ; Probability = L — 8.90

A [L] Project restores existing watershed infrastructure to its intended level of flood protection.

B Project balances environmental quality and protection from flooding in a cost effective manner.

Average annual flood damages (13.5 pts.)	0	$K
Size of developed area (2 pts.)	0	Acres
Upstream and downstream improvements (1.3 pts.)	N	Y/N
Rehabilitated reach (1.8 pts.)	Y	Y/N
Proposed development (1 pt.)	957	Acres
Downstream reach (1.3 pts.)	Y	Y/N
Maintenance cost (1.4 pts.)	4650	per Mile
Multipurpose use (1.5 pts.)	7.39	Miles
Flood insurance costs (1.6 pts.)		$
Historical flood areas (1.6 pts.)		Acres

SOCIAL FACTORS (10%)

Positive Interaction (E 4) - Check all that apply — 0.00

- [ ] With the Community
- [ ] With other agencies

Good Neighbor (E 4) - Check all that apply

- [ ] Graffiti removal or Prevention Features
- [ ] Trash removal features (vortex weirs)
- [ ] Improves esthetics of project location

ENVIRONMENTAL FACTORS (15%)

Ecological Function (E 3.2) - Check all that apply — 1.25

- [ ] Fish Barrier Removal / Structural improvement to fish habitat
- [ ] Upland Habitat Protection/Preservation
- [ ] Riparian Habitat (planting, setback or protect in place)
- [ ] Wetland Habitat Protection/Preservation
- [ ] SRA Plantings or Improved water temperature
- [ ] Hardscape Reduction

Water Quality (E 3.2) - Check all that apply

- [ ] Storm Water Treatment
- [ ] Provides opportunity for recharge
- [ ] TMDL Improvements

Trails & Open Space (E3.3) - Check all that apply

- [X] Trail friendly features
- [ ] Open Space Protection / Preservation
- [ ] Provides/Improves Bicycle Commute Route

ECONOMIC FACTORS (15%)

Funding Available from Other Agencies - Check One — 0.00

- [ ] Over 50% of project costs available from other agencies
- [ ] 26% to 50% of project costs available from other agencies
- [ ] Up to 25% of project costs available from other agencies

FY 12 FLOOD PROTECTION PROJECTS
Priority Score Summary

	Primary Objective							
	A: Protecting Existing Assets	B: Value of Protecting Non-Improved Assets	Points	Social Factor	Environmental Factor	Economic Factor	Raw Score	**Priority Score** (factor of 1.45)
Flood Protection - Lower Peninsula Projects								
10244001S Permanente Creek, SF Bay to Foothill Expressway	33	15	48	6	11	0	65	**94**
10284007S San Francisquito Creek, SF Bay through Searsville Da	3	16	19	8	12	15	54	**79**
10104001S Adobe Creek, El Camino to Rhus Ridge	0	13	13	6	4	0	23	**33**
Flood Protection - West Valley Projects								
26074002 Sunnyvale East & West Channel	26	15	41	8	6	0	55	**80**
26104001 Calabazas Creek, Miller Ave to Wardell	0	14	14	6	9	0	29	**42**
Flood Protection - Guadalupe Projects								
30154013S Guadalupe River - Downtown, I-880 - I-280	0	19	19	8	11	15	53	**77**
26154001S Guadalupe River - Upper, I-280 - Blossom Hill Road	0	17	17	10	11	15	53	**77**
Flood Protection - Coyote Projects								
40174004 Berryessa Creek, Lower Penitencia Ck to Calaveras Blv	20	1	21	4	6	15	46	**67**
26174043 Coyote Creek, Montague Expy to I-280	0	16	16	10	15	0	41	**59**
40324003S Upper Penitencia Creek, Coyote Creek to Dorel Drive	0	15	15	8	11	6	40	**58**
40264007S Lower Silver Creek, I-680 to Cunningham Ave	0	16	16	8	9	6	38	**56**
40334005 Lower Penitencia Creek, Coyote to Berryessa Creeks	33	1	34	2	1	0	38	**54**
40264011 Lake Cunningham Improvements	0	16	16	8	7	6	37	**54**
26174041S Berryessa Creek, Calaveras to Old Piedmont	0	21	21	8	7	0	36	**53**
Flood Protection - Uvas/Llagas Projects								
50284010 Llagas Creek-Lower, Capacity Restoration	33	15	48	2	6	0	56	**81**
26174051S Llagas Creek-Upper, Buena Vista Road to Wright Ave	0	15	15	4	11	15	46	**66**
Flood Protection - Multiple Watershed Projects								
00044026 San Francisco Bay Shoreline (Planning)	0	1	1	6	9	6	22	**32**
62044042 San Francisco Bay Shoreline Early Implementation	0	1	1	6	9	6	22	**32**

Appendix I

Memoranda of Specific Findings –

Canoas and San Tomas Aquino Creeks

Memoranda describing findings and recommendations to not proceed with Canoas and San Tomas Creeks

Santa Clara Valley Water District

MEMORANDUM

TO: File

FROM: Future Funding Engineering Team

SUBJECT: Canoas Creek – Feasibility of Future Funding Project

DATE: June 1, 2011

The purpose of this memorandum is to:

1) Document that the Future Funding Engineering Team received management direction to use the 2009 Corps of Engineers calculated 1% peak flow rate to analyze potential flood issues for Canoas Creek.
2) Based on the 2009 Corps 1% flow, Canoas Creek does not have a significant flood problem and is not recommended as a viable new project for flood protection measures.

Background and Analysis

Based on previously published flows (FEMA 1998 and SCVWD 1976), district records show that Canoas Creek would produce a 1% floodplain covering nearly 10,000 parcels with shallow flooding of less than one foot depth. Because of the shallow depth, FEMA does not require flood insurance in most of this area. However, the large extent of flooding and associated damages warranted a close look at Canoas by the Future Funding engineering team as a potential new flood protection project.

Recently, a 1% flow rate was published for Canoas Creek by the Corps of Engineers (2009). Of the three published flow rates, district technical and management staff (Jim Wang, Engineering Unit Manager – Hydrology, Hydraulics and Geomorphology; and Liang Lee, DOO Coyote and Pajaro Watersheds Division) have advised the Future Funding engineering team that the 2009 Corps flow represents the best available information. See Table 1, below, for a comparison between published 1% flow rates.

Location	SCVWD 1976 Green Book	FEMA (1998)	COE (2009)
Cottle Rd	510	510	490
Santa Teresa Blvd	830	830	
Blossom Hill Rd	1,400	1,400	1,000
Capital Expwy	2,000	1,960	1,400
Confluence	2,400	2,350	1,500

Table 1 – Published 1% Flow Rates, Canoas Creek.

The COE (2009) flows differ significantly from the FEMA (1998) published flows and the SCVWD Green Book (1976) flows. The COE flows are as much as 40% lower than the SCVWD Green Book or FEMA flows.

The Future Funding engineering team analyzed all published 1% flow rates using the most recent HEC-RAS model for Canoas Creek. For this analysis, the District HEC-RAS model for Canoas Creek was modified to include culvert improvements at Almaden Expressway and Nightingale Avenue; these improvements will be part of the Upper Guadalupe Project, anticipated to be completed by 2016. The FEMA and COE flows were applied to the model to determine the extent of overbanking along Canoas creek. Running the FEMA flow rates through the modified HEC-RAS model supports the previously-identified widespread but shallow overbanking. In contrast, there would be very little overbanking under the COE flows. Figure 1, attached, provides a profile view of the creek, with 1% overbanking locations indicated for both the FEMA and COE flows.

Conclusion

Although widespread shallow flooding is indicated by the 1976 SCVWD/ 1998 FEMA 1% flows, the 2009 COE 1% flows indicate little if any flooding would occur along Canoas Creek, particularly after the Upper Guadalupe flood protection project is completed. The difference between which flow is used strongly influences whether a flood protection project is economically justified at this time.

The Future Funding engineering team has been advised that the 2009 COE analysis represents the best available data. This indicates that a flood protection project on Canoas Creek would not be economically justified.

Sara Duckler
Senior Engineer

Date

Santa Clara Valley Water District

MEMORANDUM

TO: Melanie Richardson
DOO, Watersheds Capital Division

FROM: Future Funding Engineering Team

SUBJECT: San Tomas Aquino Creek -- Feasibility of Future Funding Project

DATE: June 1, 2011

This memorandum describes findings on the reach of San Tomas Aquino Creek between the Union Pacific Railroad and Williams Road, and recommends against including it in a portfolio of potential capital flood protection projects in the near future.

This reach does not currently have capacity to convey the 1% flow. Consequently, approximately 5,000 parcels are subject to flooding of roughly 1 foot depth in this area (including both FEMA and shallow flooding as mapped by the district). Economic damages for this floodplain are calculated at approximately $224 million for the 1% event (using FEMA's 2011 HAZUS software), with average annual damages calculated at approximately $5.6 million per year, based on a calculated 25-year capacity of the box culvert.

While these damages are relatively high, the impediments to improving this reach to convey the 1% flow indicate it is infeasible to include the reach in the 2011-12 portfolio of potential capital projects. The following provide qualitative reasons for this assessment:

- The 4-mile reach is located principally within the San Tomas Expressway right of way, running either beneath the expressway in a box, or between the north- and south-bound traffic lanes in a vertical-walled concrete channel. To increase conveyance, the entire length of this reach would require rebuilding, including the expressway itself. This would be both extremely costly and extremely disruptive to a major traffic thoroughfare;
- The expressway and underlying/ adjacent culvert is owned by and is the responsibility of Santa Clara County. The district does not now have legal access to make improvements;
- The reaches of San Tomas Aquino Creek downstream of this reach have been accredited by FEMA to convey the 1% flow. If additional conveyance capacity were added to the subject reach, the downstream reaches would be unable to safely convey the resulting additional 1% flow. Induced flooding and FEMA re-mapping in the adjacent neighborhoods would result. Therefore, conveyance improvements in the subject reach would necessarily require improvements in downstream reaches.

At the March 23rd, 2011 executive management meeting for the Future Funding project, Watershed managers suggested that any new capital projects should have a planning-design-construction timeline of approximately ten years to be included in the future funding program. The above-listed findings indicate that a ten-year horizon is not realistic for this project. For these reasons, we recommend that this reach not be considered further for inclusion in the portfolio of potential projects considered for funding via a new special tax or bond.

Sara Duckler, P.E., CFM
Senior Engineer
Stream Stewardship Unit

Appendix J

New Capital Project Proposals

Project proposals in District project proposal template form W72102

Upper (Upper) Berryessa, U/S 680
Alamitos Creek - not approved
Calera Creek - not approved
Upper Permanente - not approved
Mid-Coyote R6 - 8b - not approved

Upper Berryessa Creek
(Interstate 680 to Old Piedmont Road)

SAFE CLEAN WATER DRAFT PROJECT PROPOSAL

Prepared By: Stephen M. Ferranti, PE	
Stephen M. Ferranti Senior Civil Engineer Coyote and Pajaro Watersheds Projects Unit - 327	September 28, 2011
Approved By:	
Melanie Richardson Deputy Officer Watershed Capital Division	[Date]

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I. PROJECT BACKGROUND
A. Why do this Project?

The Lower Berryessa Creek flood protection project (Lower Penitencia Creek upstream to Calaveras Boulevard) is currently under design and downstream portions are under construction to provide 1% flood protection. The U.S. Army Corps of Engineers (Corps) is currently preparing a General Reevaluation Report (GRR) for the design of flood control improvements for the Upper Berryessa Creek from Calaveras Boulevard to Interstate 680.

Recently, in 2009, the Corps determined that the current alternatives for upstream of I-680 were not justified for Federal cost-sharing based on the National Economic Development (NED) plan benefits allowed by Federal regulation. Though damages due to flooding are significant along Upper Berryessa Creek upstream of I-680, but because 1% flows become less than 800 cubic feet per second, none of the flood damage reduction benefits upstream of that location can be used by the Corps to identify or economically justify an NED plan. As a result of the incremental benefit-to-cost ratios (BCRs) being less than 1.00:1 for all the various action alternatives, the Corps determined they would not be able to recommend Federal cost-sharing for the Upper Berryessa Creek project upstream of I-680.

Despite the Corps' recent decision to not participate in the Upper Berryessa Creek project upstream of I-680, significant flood damages will occur during a 1% event. SCVWD staff has completed the following analysis:

a. floodplain contains 1,600 parcels;
b. 1% flood damages were calculated using FEMA's HAZUS software (a flood damage estimator) at **$50.4 million;**
c. **Average annual flood damages** calculated using HAZUS at **$1.3 million** (based on an average assumed flood capacity of 20 years for the reach).
d. Appendix A of this document includes the Corps' Flood Damages analysis for the entire Upper Berryessa project and is included as information. The SCVWD's analysis was calculated for only the portion of the project upstream of Interstate 680.

During the Corps' preparation of the 2006 Upper Berryessa Creek Project General Reevaluation Study, Draft General Reevaluation Report and Environmental Impact Report/Statement, the Corps determined that Alternative 2A was the project's NED's plan. Alternative 2A only provided a moderate level of flood protection and would not meet FEMA requirements. On the other hand, SCVWD staff has always been committed to a Locally Preferred Plan (LPP) which would have to meet FEMA requirements and standards. Alternative 2B is similar to Alternative 2A, but instead meets or exceeds FEMA standards.

Therefore, this proposal is to plan, design, and construct Alternative 2B and take advantage of all the prior studies and analysis conducted by the Corps to date. However, because all the alternatives analyzed by the Corps involved impacts to Reach 6 and Reach 7, the greenbelt reach, where the public has opposed any improvements that will impact the existing trees, SCVWD staff recommends a design modification to Alternative 2B. SCVWD staff believes that none of the existing Corps alternatives would be supported by the public and therefore would likely not be supported by the City of San Jose. SCVWD staff recommends constructing an underground concrete bypass culvert along Cropley Avenue that avoids entirely the greenbelt reach. SCVWD staff refers to the Cropley

Avenue underground concrete bypass culvert alternative modification as Reach 6A and Reach 7A. See Figure 2 for the proposed alignment for the Cropley Avenue underground box culvert.

SCVWD staff believes the Cropley Avenue bypass alternative may eliminate the need to replace the Morrill Avenue bridge, may eliminate the complete replacement of the Cropley Avenue Bridge (bypass outlet is proposed at this location which may require a portion of the existing bridge be modified), and should eliminate impacts to the existing greenbelt reach, thus gaining the public and neighborhood support. However, SCVWD staff would have to perform the hydraulic analysis to confirm these beliefs.

B. History & Background

The Berryessa Creek Project was initiated by the United States Corps of Engineers in partial response to Section 4 of the 1941 Flood Control Act (Public Law 77-228) and focused on flood and related problems and solutions along lower Coyote Creek, downstream of Interstate 880, and on Berryessa Creek. In June 1945, the Chief of Engineers authorized a flood control investigation of survey scope that combined the study of all the streams draining into San Francisco Bay south of the Dumbarton Narrows. This included the Guadalupe River, Coyote Creek, San Francisquito Creek, Berryessa Creek, and numerous other creeks addressed collectively as Guadalupe River and Adjacent Streams. Various studies, including the Guadalupe River Interim Feasibility Report, were completed under that authority. The Berryessa Creek Project (Project) was authorized by the Water Resources Development Act (WRDA) of 1990 [Public Law 101-640, §101(a)(5)] following transmittal of the Chief of Engineer's Report on Coyote and Berryessa Creeks in February 1989. The Chief of Engineer's Report was transmitted by the Secretary of the Army to Congress in December 1989. The authorized Berryessa Creek project is approximately four miles long and flows under I-680 near the middle of the project. After Congressional authorization in WRDA 1990, discussions with the SCVWD and interested environmental groups and community members showed that the project did not have wide support in the community. Issues included the likely damages to the riparian zone from a trapezoidal concrete channel and loss of aesthetics, recreation, and natural resources. Pre-construction engineering and design efforts resulted in project refinements that had higher costs than benefits and work stopped in 1993.

In November 1993, under Section 2855 of the National Defense Authorization Act for Fiscal Year 1994 (P.L. 103-160), the project received an exception to Section 902 of the Water Resources Development Act of 1986. Projects to which this limitation applies and for which increases in costs exceed the limitations (20 percent of the authorized cost) will require further authorization by Congress raising the maximum cost established for the project. The total first cost estimated at $9,213,000 in the 1993 pre-construction studies increased to $42,000,000 in 1997 Feasibility Study. This resulted from design changes and refinements to the recommended plan.

During pre-construction studies in 1993, project refinements sought to alleviate adverse effects through the use of rectangular concrete channel to minimize removal of the riparian zone compared to the previously authorized trapezoidal concrete channels. However, this refined project met with opposition from the community and was subsequently not considered for construction pending the findings of additional feasibility-level reevaluation studies. Furthermore, at that time, refined costs and benefits resulted in a project with costs that exceeded the benefits, thereby precluding Federal involvement.

In 2001, the SCVWD requested that the Corps reevaluate flood protection alternatives along Berryessa Creek to find a more economical and environmentally acceptable solution.

In 2006, the U.S. Army Corps of Engineers completed a Draft General Reevaluation Study (F4A Study) for the Authorized Project because coordination with the SCVWD, interested environmental groups, and community members after project authorization indicated that the project did not have financial feasibility or wide support in the community. This is primarily due to widespread use of concrete channels and associated potentially adverse impacts to the riparian zone and loss of aesthetics, recreation, and natural resources.

In performing a General Revaluation Study (GRS), the Corps reevaluated all possible alternatives and identified a current National Economic Development (NED) plan to serve as the basis for Federal participation in an authorized project. The Army Corps of Engineers allows for the development of a new Locally Preferred Plan (LPP), if desired by the sponsor.

In 2009, the U.S. Army Corps of Engineers (Corps) completed a preliminary draft General Reevaluation Report (GRR). This preliminary draft GRR combined updated costs and benefits in a single analysis for the first time. The cost revisions included new criteria for certification of levees by the Corps under the National Flood Insurance Program (EC 1110-2-6067), design improvements to make the project more environmentally acceptable, and updated real estate costs that reflect current values and the value of existing creek right-of-way owned by SCVWD and the City of San Jose. Economic benefit updates included revised residual damages and updated price levels. During review of the preliminary draft report, Corps staff determined previous analysis included economic benefits which do not meet the minimum flow criteria specified by Federal regulation. Corps also determined that the benefits and costs used in the incremental analysis of the upstream and downstream reaches had not been updated since 2006.

The Corps participation in flood damage reduction projects on small streams is restricted by Part 238 of Title 33 of the Code of Federal Regulations, which has also been published as Engineer Regulation 1165-2-21, Flood Damage Reduction Measures in Urban Areas. The regulation specifies, "Urban water damage problems associated with a natural stream or modified natural waterway may be addressed under the flood control authorities downstream from the point where the flood discharge of such a stream or waterway within an urban area is greater than 800 cubic feet per second (cfs) for the 10-percent flood (one chance in ten of being equaled or exceeded in any given year) under conditions expected to prevail during the period of analysis." The regulation also specifies, "Flood reduction measures, such as dams or diversions, may be located upstream of the particular point where the hydrologic criteria...are met, if economically justified by benefits derived within the stream reach which does qualify for flood control improvement. Similarly, the need to terminate flood control improvements in a safe and economical manner may justify the extension of some portions of the improvements, such as levee tiebacks, into areas upstream of the precise point where Federal flood control authorities become applicable."

The hydrology used in the Corps' 1987 feasibility report, which resulted in authorization of the Berryessa Creek project, indicated that the 800 cfs limit was near the upstream end of the project. Hydrology for Berryessa Creek was updated by Northwest Hydraulic Consultants in 2003. Under the current hydrology, the 800 cfs limit is located at the confluence of Sierra Creek and Berryessa Creek, near Morrill Avenue. As a result, none of the flood damage reduction benefits upstream of that location can be used by the Corps to identify or economically justify an NED plan.

The Corps preliminary recalculated the incremental costs and benefits for the Upper Berryessa Project upstream of I-680, excluding benefits for the area upstream of the minimum flow criteria limit (800 cfs). The Corps determined the current alternatives located upstream of I-680 were not justified based on the NED benefits allowed by Federal regulation. The estimated benefit-to-cost ratios (BCRs) for the upstream increments of the five current action alternatives were 0.15:1, or less. Because the incremental BCRs were all less than 1.00:1, the Corps determined they would not be able to recommend Federal cost-sharing for the Upper Berryessa Creek project upstream of I-680. The preliminary recalculation was reviewed by the Corps's Chief of our Economic Risk Analysis Section.

Based on this analysis by the Corps, the Corps recommended their Final General Reevaluation Study (GRS) would identify only a NED plan and a NFIP-certifiable LPP for the project increment downstream of I-680. The Corps recommendation is based on the facts that there are several major issues upstream of I-680 that would significantly delay completion of the GRS process and, therefore, delay significantly the flood control project improvements downstream of I-680. Major issues upstream of I-680 include, but are not limited to, development of a bypass alternative along Cropley Avenue, addressing environmental and residential concerns in the greenbelt reach, and incorporating new Corps requirements for vegetation-free zones.

The Federal cost-share for the LPP would be based on the cost of the NED plan. The portion of the Berryessa Creek project upstream of I-680 would remain Federally-authorized, and could either be constructed by the SCVWD without Federal participation, or could potentially become the subject of a future GRS if there are subsequent changes in without-project conditions that significantly improve economic feasibility.

II. PROJECT OBJECTIVES

The Corps and SCVWD jointly developed the following objectives for the Authorized Project.

- Reduce flood damages from Berryessa Creek to residential, commercial, and industrial areas, and provide, if possible, protection from the 1-percent flood event throughout the study reach;
- Restore environmental values wherever possible through the study reach consistent with the flood reduction purpose of the project;
- Use the SCVWD's Natural Flood Protection (NFP) objectives when evaluating the alternatives and selecting the locally preferred project alternative. These objectives and criteria became effective March 1, 2005 and apply to all of the Water District's *Clean, Safe Creeks and Natural Flood Protection Program* projects. They consist of the following nine objectives:
  1. Flood protection: Focuses on providing protection to lives and property against the potential damages from large floods;
  2. Ecology: Examines the potential to protect, enhance, or restore the natural resource benefits of streams and the watershed in ecological terms;
  3. Geomorphology/Stable Channel: Addresses the ability to effectively manage the water and sediment from the watershed under both extremely high flows and routine low flows;
  4. Maintenance: Focuses on minimizing the long-term obligation of operating and maintaining capital projects once they are constructed;

5. Watershed Context: Assesses how appropriate a project is to its location within the watershed and the physical, ecological, and social contexts;
6. Water Quality and Quantity: Addresses water supply related goals, including quality and quantity of surface and groundwater associated with streams;
7. Local Partner Agencies: Measures how effectively a potential project meets goals of both the Water District and the partner communities affected by the project;
8. Community Benefits: Addresses the full range of community benefits beyond flood protection that might be integrated into a creek project; and
9. Life-Cycle Costs: Examines project costs as a long-term investment rather than a one-time cost.

In addition, the alternatives developed were formulated to meet all requirements for an integrated Corps of Engineers' GRR and EIR/EIS, the NEPA process, and other planning considerations identified below.

- Coordinate closely with affected cities on their recreational projects to avoid design conflicts to the extent practical, and provide opportunities for cities to incorporate recreational features into the project;
- Reduce maintenance requirements especially due to sedimentation, primarily at the Cropley Avenue and Piedmont Road culvert and the sediment basin immediately downstream;
- Improve water quality by reducing sedimentation within the creek;
- Cooperate with the mutually beneficial goals of related plans, projects, and agencies; and
- Fully coordinate with other Federal, State, local agencies, and stakeholders.

Recreation and ecosystem restoration are recognized and generally supported as project purposes by the Corps of Engineers, but are not included in the existing Berryessa Creek project authorization. Adding these purposes to the Authorized Project would require additional authority from Congress, which would require a potentially lengthy process. Because no potential sponsor has supported adding purposes to the Authorized Project, additional purposes have not been evaluated or proposed. Instead, the Corps and the SCVWD have sought to provide an environmentally sensitive design and opportunities for future recreation improvements within the scope of the currently authorized flood damage reduction project. Recreation and ecosystem restoration could be added to the project as non-Federally funded betterments without additional Congressional authority.

III. PROJECT CRITERIA / CONSTRAINTS / ASSUMPTIONS

Project Criteria:

- The project will provide a 1 percent level of flood protection to surrounding homes and businesses to meet FEMA criteria. Flood Damages (Figure 3) - per Christy Chung's analyses:
    a. floodplain contains 1,600 parcels;
    b. 1% flood damages were calculated using FEMA's HAZUS software (a flood damage estimator) at **$50.4 million;**
    c. **Average annual flood damages** calculated using HAZUS at **$1.3 million** (based on an average assumed flood capacity of 20 years for the reach).
    d. Appendix A of this document includes the Corps' Flood Damages analysis for the entire Upper Berryessa project and is included as information. The SCVWD's analysis was calculated for only the portion of the project upstream of Interstate 680.
- The project will preserve existing maintenance access.
- The final design will provide for the City of Milpitas and City of San Jose planned recreational opportunities. The City of Milpitas has a recreation trail project planned on

Berryessa Creek in their Trails Master Plan. The City of San Jose has also identified an interim trail project from Morrill Avenue to Piedmont Avenue. The County of Santa Clara has not yet identified a trail project on Berryessa Creek.

- The design will be consistent with the Santa Clara Valley Water District's Stream Maintenance Program guidelines and activities for maintaining channel conveyance capacity.

Constraints:

- The Project will meet SCVWD and FEMA standards for levee design.
- There is limited land available to expand the existing right-of-way.
- The project will preserve the greenbelt area within Reach 7 where heritage trees exist.
- The project will need to coordinate closely with, and obtain approval and an encroachment permit from the City of San Jose for construction of the Cropley Bypass box culvert, which will significantly reduce the impacts to the greenbelt area, where neighbors and the resource agencies have been adamant about the removal of existing trees and vegetation.
- Construction within the creek channel can only occur between the months of April and October, per resource agency permit requirements.

Assumptions:

- The levees will be raised to provide adequate capacity to convey a 1 percent flood event.
- The project will use floodwalls where insufficient ROW exists to raise levees.
- The project will require preparation of an EIR.
- Limited right-of-way will be purchased to construct the project.
- The project will preserve existing high-value riparian vegetation to the extent possible.
- The construction cost estimate for the project alternative carries the assumption that there will be zero cost for mitigation.
- The Cropley Avenue underground concrete bypass box culvert can be designed to a sufficient hydraulic capacity to eliminate the need to replace the Morrill Avenue bridge and avoid improvements to the greenbelt reach that will impact existing vegetation.
- The project will not purchase land upstream of Old Piedmont Road to construct a Sediment/Retention Basin. The Corps deleted this feature because the cost of such a feature did not warrant the benefit.

IV. PROJECT SCOPE OF WORK

The Upper Berryessa Creek project upstream of Interstate I-680, known as Reaches 5, 6, 7, 8, and 9 will consist of the following staff recommended alternatives.

Reach	Location	Major Design Feature	Description
5	100 feet upstream of I-680 to Morrill Avenue	I-680 to Morrill Avenue (Earthen trapezoidal channel) Replacement/modify bridge (Cropley Avenue)	Excavate channel thalweg as required to provide sufficient hydraulic capacity for the 1% flow Replace/modify existing Cropley Avenue bridge to conform/transition with the proposed Cropley Avenue bypass concrete box culvert. Cropley Avenue Bridge to be part of Reach 6A (Cropley Avenue bypass box culvert work. Enhance existing maintenance access by providing all weather maintenance access
6	Morrill Avenue to Secondary Sedimentation Basin	Maintenance access/Pedestrian Trail	Enhance existing maintenance access by providing all weather maintenance access

Reach	Location	Major Design Feature	Description
		Morrill Avenue Bridge	Assumes Cropley Avenue Bypass Box Culvert eliminates the need to replace the Morrill Avenue Bridge (Discuss with City of San Jose possible recreation trail throughout this reach)
7	Secondary Sedimentation Basin to intersection of Piedmont Road/ Cropley Avenue (Greenbelt Area)	Maintenance access/Pedestrian Trail Existing Sediment Basin	Enhance existing maintenance access by providing all weather maintenance access (Discuss with City of San Jose of possible recreation trail throughout this reach) Re-establish sediment basin capacity and determine ways to reduce sediment loads from upstream locations in order to reduce the interval between maintenance requirements to remove sediment from this existing basin.
6A & 7A	Cropley Avenue Bypass Box Culvert	Concrete Bypass Box Culvert (See Figure 2 for the proposed alignment)	Construct an underground concrete Bypass Box Culvert approximately 8 foot by 12 foot along the southern side of Cropley Avenue (approximately 5,600 feet). Bypass Box Culvert may need to be 6 foot high by 16 foot wide to avoid relocating the SCVWD's South Bay Aqueduct along Piedmont Road. More hydraulic analysis is needed along with potholing/surveying the SCVWD's South Bay Aqueduct. Extensive coordination needed with the City of San Jose and the various utility companies within Cropley Avenue Develop and implementation of an extensive Traffic Control Plan along Cropley Avenue Significant public outreach required to inform the neighborhood and public of the bypass to gain support for this alternative. The proposed concrete bypass will likely allow for the greenbelt to remain relatively undisturbed, thus eliminating the significant costs to mitigate impacts to the greenbelt area. More hydraulic analysis is needed to determine if replacement of the Morrill Avenue Bridge could be avoided.
8	Intersection of Piedmont Road/Cropley Avenue to Old Piedmont Road	Earthen trapezoidal channel Possibly modify existing Piedmont/Cropley culvert	Armor bed and banks for 15 fps design velocity using articulated revetment or similar More hydraulic analysis is needed to determine how the proposed Cropley Avenue concrete bypass box culvert will

Reach	Location	Major Design Feature	Description
			impact the existing Piedmont/Cropley culvert
9	Old Piedmont Road to approximately 600 feet upstream (upper Project boundary)	Replacement bridge (Old Piedmont Road)	22-foot span to replace Old Piedmont Road Bridge, reconstruct channel entrance, 3-foot high (max) levee to contain the 1% discharge

The cost estimate provided with this proposal was based on construction of the elements as described above, which included modification of the Cropley Avenue Bridge, modification of the existing Piedmont/Cropley culvert, replacement of the Old Piedmont Road Bridge, and construction of approximately 5,600 linear feet of concrete bypass box culvert along Cropley Avenue.

The phases of the project would include:

Planning Phase:

- Review and identify potential issues with the preferred alternatives for each reach.
- Formulate the recommended project
- Perform appropriate public outreach
- Prepare the Engineer's Report and appropriate CEQA document.

Design Phase:

- Obtain right-of-Way.
- Determine and develop remediation protocols for any hazardous sites to include with plans and specifications.
- Develop plans and specifications for advertisement and award the construction contract.
- Coordinated utility and bridge design work with pertinent owners.
- Identify and obtain necessary permits from pertinent owners.
- Perform appropriate public outreach.
- Obtain necessary permits from regulatory agencies.
- Prepare Operations and Maintenance manual for channel improvements.

Construction Phase

- Construct the Project
- Perform appropriate public outreach.
- Manage construction contract

Closeout Phase

- Complete As-Built drawings.
- Submit application to FEMA for a Letter of Map Revision
- Close all contracts and agreements in accounting and the contract office.
- Update the district's GIS theme on "1% shallow flooding"
- Conduct close out meetings and all other requirements identified in the Capital Project Delivery Procedure Q751D01.

V. PROJECT DURATION AND COSTS

(see table next page)

PHASE	MAJOR WORK ELEMENT	FY 1*	FY 2	FY 3	FY 4	FY 5	FY 6	FY 7	Total
Planning	1207 Project Management	$ 150	$ 150	$ 150					$ 450
	1290 Planning Study	$ 750	$ 1,500	$ 750					$ 3,000
Design	1321 Environmental Review/Regulatory Permit Acquisitions		$ 825	$ 825					$ 1,650
	Hydraulic Engineering	$ 125	$ 300	$ 125				$ 125	$ 675
	Geotechnical Engineering	$ 100	$ 125	$ 125		$ 175		$ 225	$ 750
	1407 Project Management		$ 100	$ 150	$ 50				$ 300
	1493 Design & PS&E		$ 400	$ 1,600	$ 400				$ 2,400
	1531 Land Acquisition								$ 0
Construction	1607 Project Management				$ 150	$ 150	$ 150		$ 450
	1665 Construction Management and Engineering Support				$ 400	$ 450	$ 450		$ 1,300
	1660 Construction[1]				$ 5,750	$ 5,750	$ 5,750		$ 17,250
Close-Out	1907 Project Management							$ 75	$ 75
	LOMR Submittal						$ 100	$ 125	$ 225
	Total Costs by Fiscal Year	$ 1,125	$ 3,400	$ 3,725	$ 6,750	$ 6,525	$ 6,450	$ 550	$ 28,525
	Accumulated Costs	$ 1,125	$ 4,525	$ 8,250	$ 15,000	$ 21,525	$ 27,975	$ 28,525	$ 28,525

Costs shown in thousands; FY1 is planned to be ______

[1] Includes costs for the replacement/modification of Cropley Avenue Bridge, the replacement of Old Piedmont Bridge, and the assumption the Cropley Avenue concrete bypass box culvert will eliminate the need to replace the Morrill Avenue bridge

VI. SOURCES OF FUNDING

A. District Fund(s)

Safe Clean Water Funding from new program.

B. Potential Cost-sharing

There is currently no cost sharing opportunity for this project. The U.S. Army Corps of Engineers has determined this upstream section of Upper Berryessa Creek (upstream of I-680) does not meet their guidelines and regulations for their participation.

VII. OPERATING BUDGET IMPACTS

SCVWD staff expects the project to slightly reduce the long-term operations and maintenance costs above current expenditures for these reaches by incorporation of hardscape in the upstream reaches that are subject to severe erosion and construction of Cropley Avenue bypass box culvert.

VIII. ESTIMATED LIFE CYCLE

The current estimate for project life is 50 years (to be verified during the design phase).

IX. LOCATION MAPS AND PHOTOS

The project consists of reaches 5, 6, 7, 8, and 9 (Figure 1), as well as Reach 6A & 7A, the Cropley Avenue concrete bypass box culvert (Figure 2) shown on the next 2 pages:

Figure 1: Upper Berryessa Creek Project Area Reaches

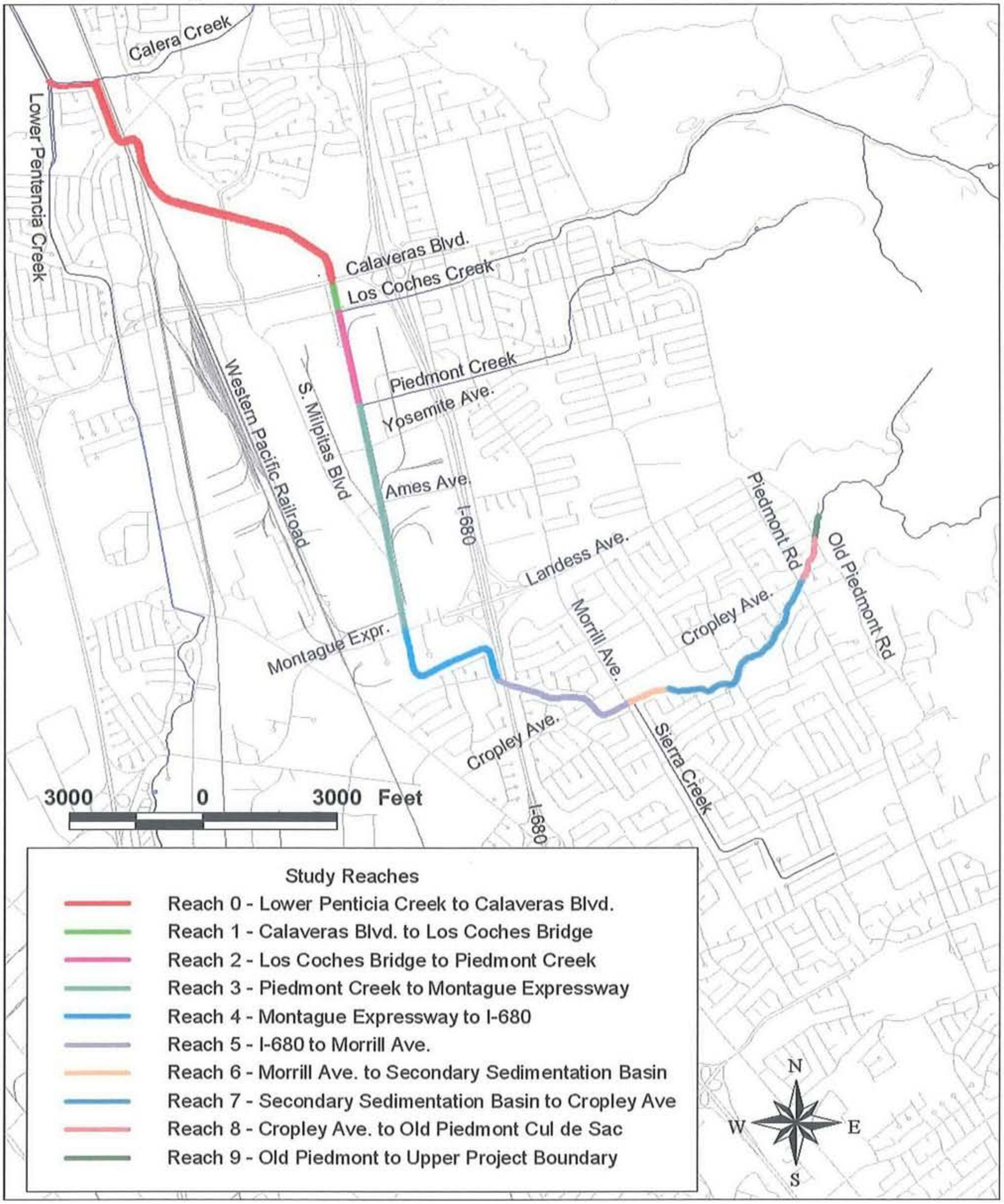
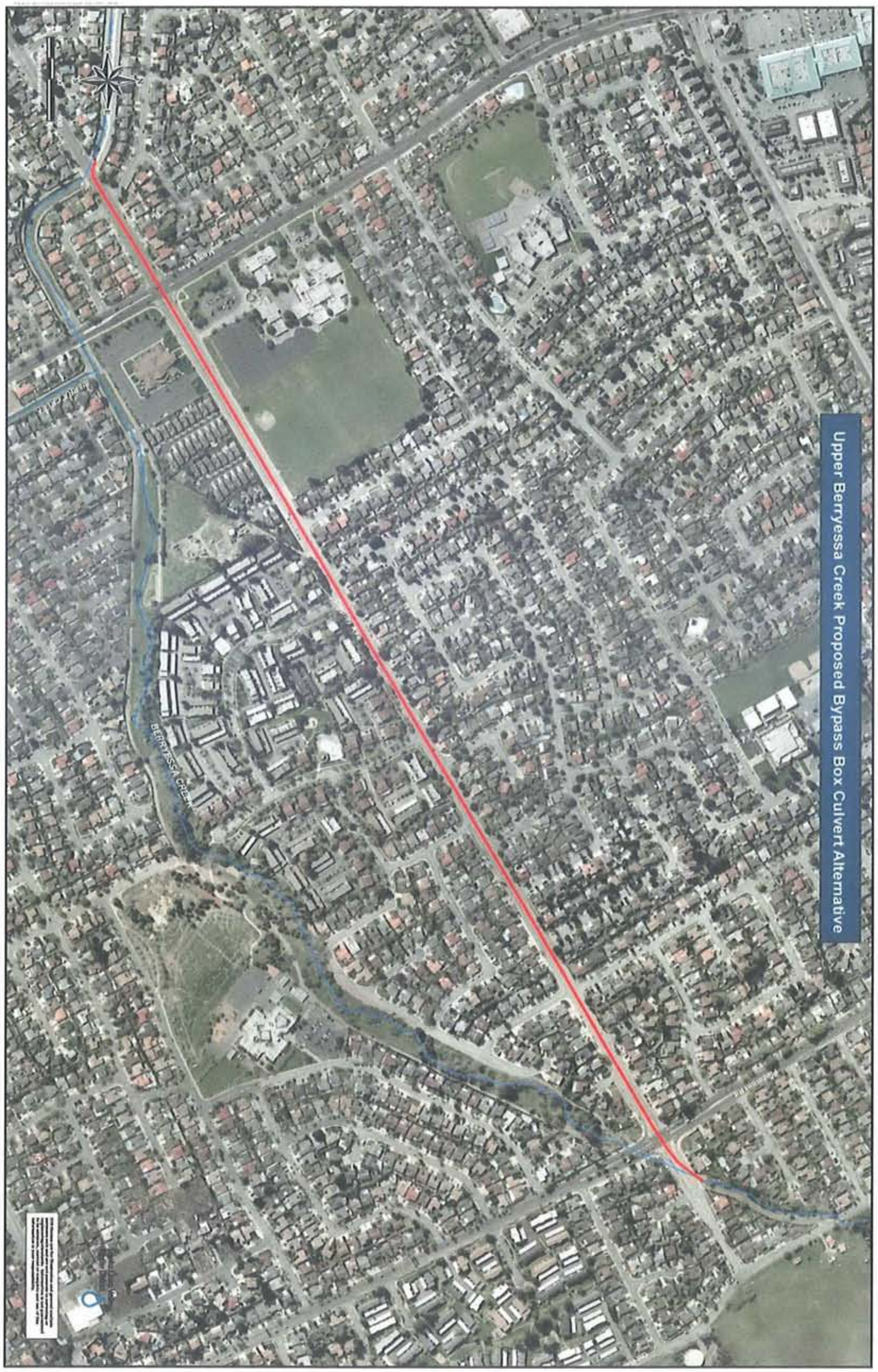
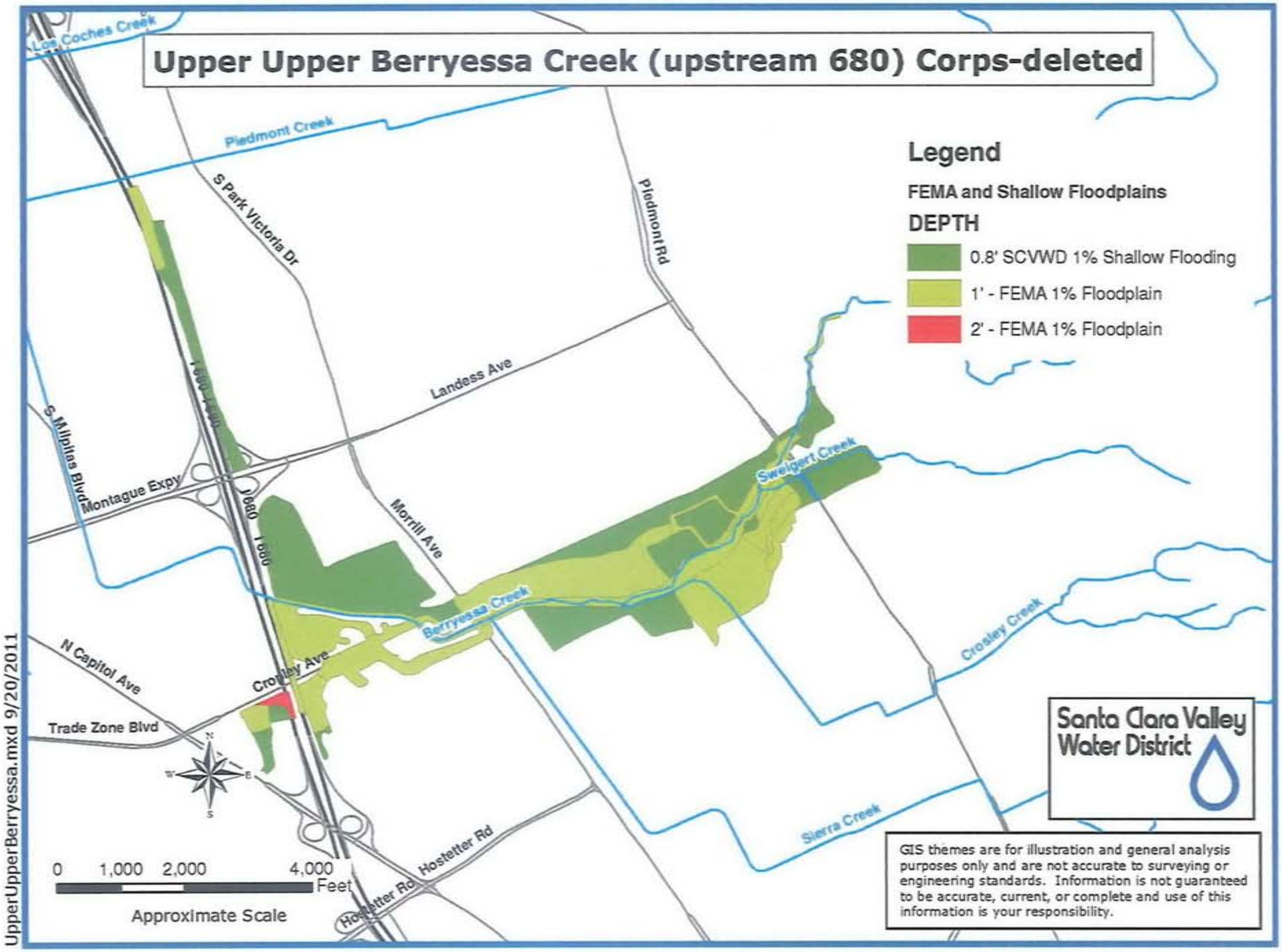


Figure 2: Reaches 6A & 7A Cropley Avenue Proposed Bypass Box Culvert Alignment





UpperUpperBerryessa.mxd 9/20/2011

Figure 3: Upper Berryessa Creek 100-Year Floodplain

ATTACHMENTS

A **Alternative Descriptions**, Excerpts from the Upper Berryessa Creek Project from the U.S. Army Corps of Engineers, General Reevaluation Study, Draft General Reevaluation Report and Environmental Impact Report/Statement, 2006.

B **Cost Estimates** – Preliminary Cost Estimates for the Upper Berryessa Creek Project for Reaches 5, 6, 7, 8, and 9, including Reaches 6A & 7A (Cropley Avenue Concrete Bypass Box Culvert).

Attachment A

Alternative Descriptions, Excerpts from the Upper Berryessa Creek Project from the U.S. Army Corps of Engineers, General Reevaluation Study, Draft General Reevaluation Report and Environmental Impact Report/Statement, 2006.

ES.1 ANALYSIS AND COMPARISON OF ALTERNATIVE MODIFICATION PLANS

ES.1.1 Preliminary Analysis

A wide variety of potential management measures were initially identified early in the formulation process in order to address water and related land resource problems in the Berryessa Creek project area. Following identification of the measures, a set of criteria was developed for the evaluation and screening. Selection of practicable measures, and subsequently, alternatives, is based on assessments of (1) the effectiveness and/or applicability of a measure in meeting identified objectives and constraints, and (2) the measure's potential environmental, economic, and social effects.

From the screened management measures, three preliminary alternative plans were formulated. These alternatives were formulated to encompass the broadest range of potential alternatives to address flood damage reduction opportunities in Berryessa Creek. Each of these preliminary alternative plans is configured to address the planning goals and objectives defined by the study. These alternative plans are as follow:

- Alternative 1 – No Action Alternative
- Alternative 2 – Earthen Trapezoidal Channel (Old Piedmont Road to Calaveras Boulevard)
- Alternative 3 – Earthen Terraced and Leveed Channel (Old Piedmont Road to Calaveras Boulevard)
- Alternative 4 – Earthen and Walled Terraced Channel (Highway 680 to Calaveras Boulevard)

Chapter 3, "Formulation of Alternative Plans," provides a more detailed description of the development of the alternative plans.

ES.1.2 Rationale for Selection of Alternatives

After the initial screening of the preliminary alternative plans, Alternatives 2 through 4 were reformulated and further developed as more refined alternatives with their primary components incorporated into the final array of alternatives. In order to provide a level of detail necessary to compare the final array of alternatives, more detailed engineering, design, cost estimating, incremental evaluation, and analysis of potential project impacts were developed for each alternative.

An incremental analysis was conducted to identify the economic justification of flood damage reduction components. The analysis was separated into two groups: upstream of I-680 and downstream of I-680. These two areas were determined to be hydraulically independent and were determined to be separable geographic areas. The analysis was based on the following methodology.

- Identify locations of channel breakouts as discharge is incrementally increased
- Identify floodplain associated with breakouts
- Identify costs of structural improvements to preclude the breakouts
- Identify flood damage reduction benefits from precluding the breakouts
- Determine benefit-to-cost ratio and net benefits for each increment

In total, ten project increments (five sizes[2]—0.05, 0.03, 0.02, 0.01, and 0.002 exceedance probability[3] events—for each of the two separable areas) were run in the Corps' HEC-FDA model. Residual damages and benefits are presented in Table 3-3. The greatest incremental benefits occur with the first increment – the more frequent 0.03 exceedance probability – and again with the 0.01 exceedance probability event. It was determined that channel improvements would not only eliminate damages from the more frequent events but would also reduce the magnitude of damage for the larger residual events.

Preliminary project cost estimates were developed for both the upstream and downstream areas. Furthermore, costs were estimated for different components and capacity sizing which provide different project performance for each incremental alternative. Annual cost estimates are shown in Table 3-4 and Table 3-5 for the upstream and downstream increments, respectively. Annual benefits and benefit-to-cost ratios for each incremental alternative are presented in Table 3-6 and Table 3-7 for the upstream and downstream areas, respectively.

Based on preliminary analysis, there are several alternatives with positive net benefits indicating that flood damage reduction for Berryessa Creek is economically justified and in the Federal interest.

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[2] The probabilities (0.05, 0.03, 0.02, 0.01, and 0.002) refer to project performance and indicate the chance that the event is exceeded in any one year. Therefore, the previous nomenclature of the "100-year flood" is more properly defined as the flood having a 1 percent or 0.01 chance of being exceeded in any one year. Similarly, the 0.05 flow was previously called the "20-year" flow, the 0.03 flow was previously called the "33-year" flow, the 0.02 flow was previously called the "50-year" flow, and the 0.002 flow was called the "500-year" flow.

[3] Exceedance probability – chance of having an equal or greater magnitude flood event in any given year. For example, 0.02 exceedance probability equates to a 1 in 50 chance of having a flood event in any given year.

Based on reasonable maximization of net benefits, the preliminary NED plan would include an upstream and downstream increment that conveys the median discharge associated with the 0.01 exceedance probability event. Chapter 3, "Formulation of Alternative Plans," provides a more detailed description of the incremental analysis of the alternative plans.

ES.8.3 Description of Alternative Modifications Considered in Detail

ES.8.3.1 Alternative 1 – No Action Alternative

The No Action Alternative is carried forward and analyzed to provide a basis from which to assess the advantages and disadvantages of the other study alternatives. This alternative assumes the likely future conditions in the project area without implementation of any of the action alternatives. Under this alternative, the Authorized Project would not be completed, objectives for flood protection would not be met, and an unacceptable public health and safety hazard – flooding in the cities of Milpitas and San Jose – would continue to occur.

ES. 8.3.2 Alternative 2A – Incised Trapezoidal Channel – Moderate Protection

Alternative 2A provides flood damage reduction benefits along Berryessa Creek by incorporating channel and other improvements designed to convey the median discharge associated with the 0.01 exceedance probability event for the entire project reach. This alternative would provide flood control utilizing channel excavation and bridge modifications to increase conveyance in the project footprint that could be constructed within the existing right-of-way. Levees are extended, as needed, to maintain consistent capacity throughout the project.

Alternative 2A would involve modification and/or replacement of bridge and culvert crossings and modification of channel reaches downstream of I-680 with an earthen trapezoidal shape. The following modifications are proposed.

- Construction of earthen levees upstream of Old Piedmont Road to convey the median discharge associated with 0.01 exceedance probability event
- Replacement of Old Piedmont Road Bridge with a 22-foot span bridge
- Bed and bank armoring in channel reach between Old Piedmont Road and Piedmont-Cropley Culvert
- Replacement of Piedmont-Cropley Culvert with a 20-foot span bridge
- Modification of sediment basin downstream of Piedmont-Cropley Culvert
- Earthen levees, with top widths ranging from 12 to 18 feet, to convey the median discharge associated with 0.01 exceedance probability event in the Greenbelt reach; side

slopes of 2:1 outboard, 3:1 inboard, with one or both levees acting jointly as maintenance access

- Replacement of pedestrian bridge at Messina Drive to maintain pedestrian access due to impacts from increased upstream channel conveyance
- Replacement of Morrill Avenue culvert and upstream sidewalls with a 26-foot span bridge
- Replacement of Cropley Avenue culvert with a 24-foot span bridge
- Channel excavation and earthen levee construction from I-680 to Calaveras. Access road located within channel, where necessary, for conveyance. A recreational trail and/or secondary access road could potentially be located along one of the banks. Typical sections shown on Figure 3-9.
- Replacement of Montague Expressway Culvert with a 30-foot span and raised headwall
- Replacement of UPRR trestle with a triple box culvert
- Shoring of bridge abutments at Ames Avenue and Yosemite Drive to accommodate widened channel
- 1.5-foot headwall extension at Los Coches Street
- Transition structures and 1.5-foot headwall extension at Calaveras Boulevard
- Mitigation measures to be implemented are described in Section 3.7.4.

ES. 8.3.3 Alternative 2B – Incised Trapezoidal Channel – FEMA-Certification Protection

Alternative 2B provides flood damage reduction benefits along Berryessa Creek by incorporating channel and other improvements designed to convey the median discharge associated with the 0.002 exceedance probability event for the entire project reach. Similar to Alternative 2A, this alternative would provide flood control utilizing channel excavation and bridge modifications to increase conveyance in the project footprint that could be constructed within the existing right-of-way. Levees are extended, as needed, to maintain consistent capacity throughout the project.

Alternative 2B would involve modification of structures and channel reaches downstream of I-680 with an earthen trapezoidal shape. The following modifications are proposed.

- Construction of earthen levees upstream of Old Piedmont Road to convey the median discharge associated with the 0.002 exceedance probability event
- Replacement of Old Piedmont Road Bridge with a 36-foot span
- Bed and bank armoring in channel reach between Old Piedmont Road and Piedmont-Cropley

- Replacement of Piedmont-Cropley culvert with a 28-foot span
- Modification of sediment basin downstream of Piedmont-Cropley
- Earthen levees to convey the median discharge associated with 0.002 exceedance probability event in Greenbelt reach. The levee top width would be dependent on the necessary height and may incorporate maintenance access on one or both sides.
- Replacement of pedestrian bridge at Messina Drive to maintain pedestrian access due to impacts from increased upstream channel conveyance
- Replacement of Morrill Avenue and upstream channel walls with a 36-foot span
- Replacement of Cropley Avenue with a 32-foot span
- Channel excavation and earthen levee construction to convey the median discharge associated with 0.002 exceedance probability event from I-680 to Calaveras Boulevard, as shown on Figure 3-10.
- Replacement of Montague Expressway crossing with a 46-foot span
- Replacement of UPRR trestle with a triple 12-foot box culvert
- Replacement of UPRR culvert with a 40-foot span
- Shoring of bridge abutments at Ames Avenue and Yosemite Drive to accommodate widened channel
- Replacement of Los Coches Street with a 60-foot span
- Replacement of Calaveras Boulevard with a 60-foot span
- Mitigation measures to be implemented are described in Section 3.7.4.

ES. 8.3.4 Alternative 3A – Terraced Trapezoidal Channel – Moderate Protection

Alternative 3A would provide a more environmentally-sensitive project with a smaller inner channel with a capacity on the order of a 2-year event or less. This alternative would allow for the construction of benches above the main channel that act as a floodplain. These benches may be vegetated. Due to the reduced main channel size, Alternative 3A would require higher levees than Alternative 2A in order to confine the same design flow. The project footprint encroaches on adjacent parcels, and additional right-of-way acquisition would be required for Alternative 3A.

Project features upstream of I-680 are as described in Alternative 2A. The structural modifications downstream of I-680 are also similar with those described in Alternative 2A.

ES. 8.3.5 Alternative 3B – Terraced Trapezoidal Channel – FEMA-Certification Protection

Alternative 3B provides flood damage reduction benefits along Berryessa Creek by incorporating channel and other improvements designed to convey the median discharge associated with the 0.002 exceedance probability event for the entire project reach. Similar to Alternative 3A, Alternative 3B would provide a more environmentally-sensitive project with a smaller inner channel with a capacity on the order of a 2-year event or less. Alternative 3B would allow for the construction of benches above the main channel that act as a floodplain. Due to the reduced main channel size, Alternative 3B would require higher levees than Alternative 2B in order to confine the same design flow.

ES. 8.3.6 Alternative 4A – Walled Trapezoidal Channel – Moderate Protection

Alternative 4A takes the concepts from Alternative 3A (vegetated floodplain benches); however, instead of utilizing levees to confine the flows, concrete floodwalls would be extended vertically from the outer edges of the floodplain bench. This would allow Alternative 4A to be constructed within the existing right-of-way. In some locations, the right-of-way restrictions require adaptation of the typical section to accommodate the access road within the available right-of-way. In areas with limited right-of-way (e.g. in the vicinity of Montague Expressway), the access road would need to be located on the channel side of the floodwall to allow for additional conveyance area. Transition ramps would be needed in areas where the access road location changes.

ES. 8.3.7 Alternative 4B – Walled Trapezoidal Channel – FEMA-Certification Protection

Alternative 4B takes the concepts from Alternative 3B (vegetated floodplain benches); however, instead of utilizing levees to confine the flows, concrete floodwalls would be extended vertically from the outer edges of the floodplain bench. This would allow Alternative 4B to be constructed within the existing rights-of-way. Because Alternative 4B involves replacement of bridge and culvert crossings, which would create backwater conditions in the 0.01 flow profile (Alternative 4A), with open-span structures that would pass the discharge, the 0.002 water surface elevations are lower than those of 0.01 in much of the channel reach.

2.3.2.2 Problem Areas

The descriptions and problems presented herein are a result of reviewing historic flood information, field inspections, professional judgment of the Project Delivery Team, technical analyses especially involving detailed hydraulic modeling of the system, and review of available data and reports. Table 2-5 provides information on the channel capacities by reach.

Table 2-5 Channel Flows and Capacities

GRR Study Reach	Description	Station	100-Year Flow (cfs)	Channel Capacity (cfs)	Average Channel Capacity

					(cfs)
5	I-680 – Cropley Avenue	25575 – 27569	2,140	>3,140	>3,140
5/6	Cropley Ave. – Sierra Creek	27569 – 28656	2,140	1,700 – >3,140	1,700
6	Sierra Creek – Crosley Creek	28656 – 31440	1,740	700 – >2,600	1,000
6	Crosley Creek – Sweigert Creek	31440 – 33500	1,530	700 – 2,300	1,000
6/7/8	Sweigert Creek – Old Piedmont Road	33500 – 35170	1,430	2,100 – 2,300	2,100
9	Upstream Old Piedmont Road	Upstream 35170	1,430	1,140 – 1,350	1,140

(c) Description of Reaches and Associated Problems

Morrill Avenue to Highway 680 (Reach 5)

A concrete lined channel begins 150 feet upstream of the reach at Sierra Creek and continues to Morrill Avenue. The flow in Berryessa Creek will overflow at Morrill Avenue Culvert for the larger events due to the large inflow from Sierra Creek. Due to the configuration of the Morrill Avenue Bridge a headwall serves to direct overflows at the culvert away from the creek and down Morrill Avenue. Table 2-8 depicts the estimated overflows from a range of frequency events.

Table 2-8 Morrill Avenue Overflow

Flood Event	Overtopping Flow (cfs)
50-Year	0
100-Year	10
200-Year	105
500-Year	1,215

The flow overtopping the Morrill Avenue Culvert flows south of the channel and west toward Highway 680. North of the channel the Cropley-Piedmont culvert overflow flows west toward Highway 680, then south, back into the channel just upstream of I-680. Highway-680 is assumed to act as a barrier to flow in the downstream direction. From Cropley Avenue to Highway 680, the trapezoidal channel is concrete. The capacity of this segment of the channel is estimated to carry a 500-year event with reasonable certainty.

The flooding of residential structures in this reach is due to the overflows from Morrill Avenue and the Cropley Avenue culverts. If upstream actions are not taken to limit the Cropley Avenue culvert overflows, the flood threat to the low lying structures and associated contents in the vicinity of Berryessa Creek will continue.

Piedmont-Cropley Culvert to Morrill Avenue, also called the Greenbelt Area (Reaches 6 and 7)

This upper end of Reach 7 begins just downstream of the Cropley Avenue culvert at the existing sediment basin. The creek flows through the only remaining floodplain with a moderate-to-high quality riparian community of grasses and trees until it reaches the park near the school at the lower limits of Reach 7. A pedestrian footbridge crosses the stream near the upper limits of Reach 8. The channel and floodplain are relatively stable throughout both reaches until the drop

structure located upstream of Sierra Creek some 600 ft above Morrill Avenue. This lower segment is concrete-lined. A major control structure exists just upstream of the confluence with Sierra Creek. Flows through these two reaches are intermittent, although pools are present in the greenbelt for most of the year.

Continued maintenance activities in the floodplain such as mowing and clearing are degrading the riparian habitat and contributing to the erosion of the floodplain and streambanks. Uncontrolled public use is also damaging the streambanks.

Old Piedmont Road to Piedmont-Cropley Avenue Culvert (Reach 8)

The upper end of the reach is the Old Piedmont Road Bridge. The bridge has been overtopped several times, most noticeably in 1983. Estimated flood depths and discharge overflow values for the 100-, 200- and 500-year events are shown in Table 2-6. Floodwaters overtopping the bridge and road flood adjacent streets and yards and in some instances may inundate structures. However, not all the flow overtopping the bridge will escape into the floodplain; rather flow will split with some escaping and flowing down adjacent streets; with the remaining flow returning to the channel. Once flow escapes the channel at Old Piedmont Road and flows down adjacent streets, it was assumed that the flow would return to the channel further downstream, just upstream of Highway 680.

Table 2-6 Old Piedmont Road Overflow

Flood Event	Depth Over Old Piedmont Road (ft)	Escaping Flow (cfs)
100-Year	1.3	60
200-Year	1.8	130
500-Year	2.9	320

The bridge has an existing concrete apron and drop structure which likely precludes all fish passage. Downstream of the bridge the channel is steep, bends to the left, and shows noticeable degradation to the channel bottom and side slopes. The erosion along the right bank threatens the adjacent residential yards. The SCVWD service road follows the stream adjacent to the top of the left bank. Erosion of both bed and banks is likely to continue to occur in this reach.

The existing 400 feet Cropley and Piedmont Culvert at the downstream end of the reach is the major problem feature of the Berryessa Creek system above Highway 680. It is located diagonally under the intersection of Cropley Avenue and Piedmont Road. The 12-feet-by-7-feet RCB culvert capacity is currently significantly reduced due to sediment deposition throughout its length. It is 50- and 25-percent blocked at the upstream inlet and downstream outlet, respectively. The existing culvert capacity is therefore estimated capable of carrying less than the 2-percent event flow. The adjacent residences near the inlet of the culvert are threatened when flows overtop the headwall of the culvert. Velocities are estimated to exceed 5-6 fps some 1600 ft down Cropley Avenue, flooding the street and yards. The overflows pond in the low residential areas along Berryessa Creek between Morrill Avenue and Highway 680 and inundate numerous structures. The culvert is located at a natural alluvial fan area where sediment deposition rates are commonly high (as the steep channel suddenly transitions to the flatter valley).

Table 2.7 depicts the estimated overflows from a range of frequency events.

Table 2.7 Piedmont-Cropley Overflow

Flood Event	Overtopping Flow (cfs)
50-Year	75
100-Year	355
200-Year	585
500-Year	755

If flood damage reduction measures and other actions are not implemented, the existing conditions will likely degrade into the future with more streambank erosion and sediment deposition at the Cropley Avenue culvert. The threat from overtopping of the Old Piedmont Road Bridge and the Cropley Avenue culvert will continue as will the associated flooding of residential structures adjacent to the stream and from Morrill Avenue to Highway 680. The velocities and depths of the overflows down Cropley Avenue also present a serious threat to the traffic and cross traffic from the numerous flooded intersections.

Upstream of Old Piedmont Road (Reach 9)

The authorized upper project limit is 500 feet above Old Piedmont Road. Erosion upstream of the project area and resulting sediment transport through this reach into the lower system is a major problem. Much of the sediment appears to come from hillside erosion. Stream bank erosion is also noted in several locations (NHC, 2003). If no action is taken it is assumed that sediment will continue to be transported from this reach into the downstream reaches of Berryessa Creek. The riparian habitat is likely to degrade with potential development of agricultural lands in the future.

2.3.2.3 Existing Without-Project Flood Damages

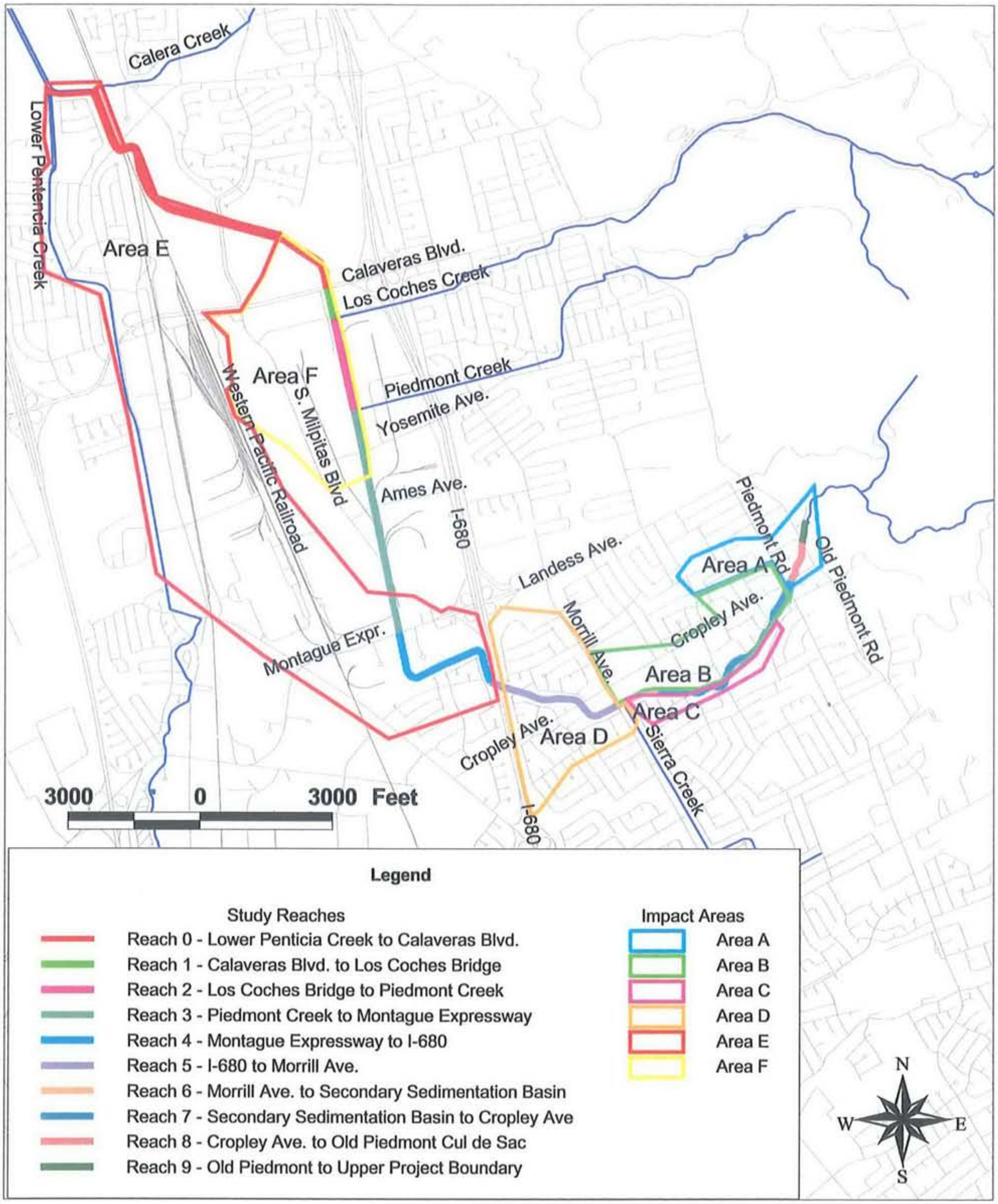
(a) Impact Areas

For economic evaluation and project performance purposes, the study area was divided into six economic impact areas. The impact areas delineations, as described below, were established to address changes in hydrology, hydraulics, and economic conditions throughout the study area. The delineations also took into consideration the types and locations of potential flood damage reduction measures and actions that may be formulated and evaluated during the next phase of the process. A map of the six impact areas is shown in Figure 2-5.

- Impact Area A lies farthest east and runs from Old Piedmont Road to the intersection of Cropley Avenue and Piedmont Road. Inundation in this impact area is limited to street flooding.
- Impact Area B includes Cropley Avenue and runs along the right bank from Piedmont Road to Morrill Avenue. The area is primarily residential.

- Impact Area C runs along the left bank just past Majestic Elementary and Berryessa Creek Park downstream just east of Morrill Avenue.
- Impact Area D runs from Morrill Avenue to the I-680 Freeway. This area in San Jose is entirely residential.

Figure 2-5 Economic Impact Areas



- Impact Area E is the largest impact area in the study and begins just west of I-680. The area is bounded by Capitol Avenue, Abel Street, and Berryessa Creek. This area includes the Midtown region on Milpitas and includes residential, commercial, public, and industrial land uses.
- Impact Area F runs along a short section of the left bank of Berryessa from Yosemite Drive to near Los Coches Street and east of WP railroad line. This impact area is highly industrial with many hi-tech firms.

(b) Inventory

The structural inventory was based on data gathered from assessors parcel data and on-site inspection of the structures within the floodplain. Structures were determined to be within the economic data area by using Geographical Information Systems (GIS) to compare the 500-year floodplain boundary with the spatially referenced assessor parcel numbers (APN). Information from the assessors parcel database (such as land use, building square footage, and address) was supplemented during field visits for each parcel within the floodplain. Parcels, with structures, were categorized by land use and grouped into the following structural damage categories.

- Single Family Residential – includes all parcels represented by a single unit such as detached single family homes, individually owned condominiums, and townhouses.
- Multiple Family Residential – includes residential parcels with more than one unit such as apartment complexes, duplexes, and quadplex units. Each parcel may have multiple structures.
- Commercial – includes retail, office buildings, and restaurants.
- Industrial – includes warehouses and light and heavy manufacturing facilities. This also includes many computer and bio-tech industries that are in the Milpitas area.
- Public – includes both public and semi-public uses such as post office, fire department, government buildings, schools, and churches.

All parcels with structures were assigned to one of the listed categories. Some parcels have more than one physical structure and some structures, such as condominiums, are represented by multiple parcels. Table 2-9 displays the total number of parcels with structures by category.

Table 2-9 Structural Inventory

Economic Impact Area	Number of Parcels with Structures within the 0.002 Exceedance Probability Floodplain by Land Use						
	Single Family Residential	**Multiple Family Residential**[1]	**Commercial**	**Industrial**		**Public**	**Total**
				General	**Tech**		
Area A	46	0	0	0	0	0	46
Area B	64	298	0	0	0	1	363
Area C	13	0	0	0	0	0	13
Area D	368	105	1	0	0	0	474
Area E	1,021	1,570	101	22	22	17	2,753
Area F	30	0	12	9	24	4	79
Total	**1,542**	**1,973**	**114**	**31**	**46**	**22**	**3,728**
	Number of Parcels with Structures within the 0.01 Exceedance Probability Floodplain by Land Use						
Area A	9	0	0	0	0	0	9
Area B	23	225	0	0	0	1	249
Area C	3	0	0	0	0	0	3
Area D	189	45	0	0	0	0	234
Area E	704	1,570	92	20	17	13	2,416
Area F	10	0	5	9	24	2	50
Total	**938**	**1,840**	**97**	**29**	**41**	**16**	**2,961**

[1]Represents the total number of residential units for all multi-family parcels

(c) Value of Damageable Property- Content Value

In addition to structures, building contents can also be at risk of flood damages. For this study, content values were estimated as a percentage of depreciated structure value based on land use. In the 1992 study, detailed content surveys were made to determine content percentages specific to the Milpitas/San Jose area. For this reevaluation study, additional content surveys were completed to confirm or adjust values used in the original study. Based on these survey results, the content percentages from the 1992 study are determined to be reasonable.

Total value of damageable property includes the structural and content values described for the parcels within the 0.002 exceedance probability floodplain. Table 2-10 shows the total structure and content values by category and economic impact area. In total, the study area has over $2 billion worth of estimated damageable property. Total value of $1 billion for structures within the floodplain is over eight times the value presented in the 1987 feasibility study. Factors leading to these increases include additional structures, general increases in valuation from 1986 to 2004, improvements in existing structures, and increased labor and construction costs in the area.

Table 2-10 Value of Damageable Property within the 0.002 Exceedance Probability Floodplain

($1,000,000s – October 2005 Prices)

Structure Category	Area-A	Area-B	Area-C	Area-D	Area-E	Area-F	Total
SFR-Structure	7.4	10.3	2.3	56.2	173.2	8.7	258.1
SFR-Content	3.8	5.1	1.1	28.1	86.6	4.3	129.0
MFR-Structure	0	24.7	0	9.8	204.8	0	239.3
MFR-Content	0	12.3	0	4.9	97.2	0	114.4
Commercial-Structure	0	0	0	3.3	197.8	31.4	232.5
Commercial-Content	0	0	0	4.3	213.5	27.5	245.3
Industrial-General Structure	0	0	0	0	62.2	27.7	89.9
Industrial-Tech Structure	0	0	0	0	90.5	123.5	214.0
Industrial- General Content	0	0	0	0	81.5	36.3	117.8
Industrial-Tech Content	0	0	0	0	169.2	230.9	400.1
Public- Structure	0	7.1	0	0	32.2	12.2	51.5
Public- Content	0	3.2	0	0	14.5	5.5	23.2
Total Value	**11.2**	**62.7**	**3.4**	**106.6**	**1,423.2**	**508.0**	**2,115.1**

(d) Expected Annual Damage – Existing Without-Project Conditions

Expected annual damages (EAD) were estimated using the risk-based Monte Carlo simulation program HEC-FDA. The HEC-FDA program integrates hydrology, hydraulics, geotechnical, and economic relationships to determine damages, flooding risk, and project performance. Uncertainty is incorporated for each relationship, and the model samples from a distribution for each observation to estimate damage and flood risk. The model is described in detail in the Economic Appendix. The Berryessa Creek model has the following relationships built for each economic impact area.

- Probability-Discharge (with uncertainty determined by period of record)
- Stage-Discharge (stage in the channel with estimated error in feet)
- Interior-Exterior Stage (stage in the floodplain vs. stage in the channel)
- Stage-Damage (for each damage category)

EAD are calculated as the numerical integration of the area under the probability-damage curve. The derived probability damage functions from the HEC-FDA model for each impact area is provided in the following table. These damage values differ from the calculated damages by event shown in the stage-damage curves (detail in the Economic Appendix) due to uncertainties in each relationship.

Table 2-11 Probability Damage Functions from the HEC-FDA Model

October 2005 Prices ($1,000s)

Exceedance Probability	Total Damage by Economic Impact Area and Event					
	A	**B**	**C**	**D**	**E**	**F**
0.100	0	151	0	87	6,814	24,126
0.050	0	1,511	0	915	25,285	44,594
0.040	0	1,940	5	1,108	32,576	49,749
0.020	52	4,971	43	3,219	65,657	61,787
0.015	138	6,059	63	5,399	86,281	65,503
0.010	318	7,385	103	7,812	116,046	70,082
0.004	1,022	9,563	394	21,930	172,309	71,862
0.002	1,185	9,704	394	22,299	185,575	71,862
0.001	1,185	9,704	394	22,299	185,680	71,862

EAD, under existing without-project conditions, was estimated for each damage category for all six impact areas. Results are summarized in the following table.

Table 2-12 Expected Annual Damage – Existing Without-Project Conditions

$1,000s, October 2005 Prices

Damage Category	EAD by Economic Impact Area						
	A	**B**	**C**	**D**	**E**	**F**	**Total**
Single Family Residential	8	50	4	214	821	49	1,147
Multi-Family Residential	0	161	0	32	226	0	419
Commercial	0	0	0	2	891	126	1,020
Industrial	0	0	0	0	2,278	5,025	7,304
Public	0	19	0	0	82	64	164
Automobile	1	25	0	32	103	1	162
Emergency	0	16	0	9	66	1	93
Roads	0	2	0	4	37	3	46
Total EAD	**9**	**273**	**4**	**294**	**4,505**	**5,270**	**10,355**

2.3.2 Future Without-Project Conditions

The future without-project condition is defined as that condition expected to exist over the 50-year period of analysis in the absence of any action taken (by the Federal government) to solve the identified problems. It consists of the base year (2010 – see Section 6.1.2) conditions projected to a future year when it is assumed that a proposed plan's construction would be complete and operating, and how conditions may change during this period if no Federal action takes place. Forecasting this condition is important to the evaluation and comparison of alternative plans and the identification of impacts (both beneficial and adverse) attributable to the proposed project.

For the purposes of this analysis, it is assumed that no new flood damage reduction project would be constructed on upper Berryessa Creek in the absence of a federally cost-shared and locally-supported project. The SCVWD's Lower Berryessa Creek Project is assumed to be part of the without-project conditions.

2.3.3.1 Expected Annual Damage – Future Without - Project Conditions

The City of Milpitas currently has a redevelopment plan for Midtown area, with some of the land lying within economic Impact Area E of this study. Primarily along the South Main and Abel Street corridors, the plan calls for renovation of many of the existing buildings and new high density residential and commercial construction on existing vacant acres near the light rail and proposed BART stations. This area is the only portion of the study floodplain identified for future growth. Development is projected to be complete by 2020.

(a) Stage-Damage Future Conditions

Damages were estimated for the new construction using @RISK model for each event. Note that damages were minor in comparison to the value of future property due to the assumption of raising first floor elevations and the corresponding shallow depths for the infrequent events. The future conditions stage-damage functions for the Midtown area are shown in the following table.

Table 2.13 Stage-Damage Functions: Additional Damage – Future Growth Midtown Milpitas – Future-Without Project Conditions

(in $1,000s – October 2005 Prices)

Damage Category	Estimated Damage Statistics	Frequency of Event followed by Corresponding Stage (elevation in feet)			
		0.020	**0.010**	**0.005**	**0.002**
		19.6	19.8	20.1	20.2
SFR	Mean	0	0	0	0
	Standard Dev	0	0	0	0
MFR	Mean	0	0	4,472	8,104
	Standard Dev	0	0	3,291	3,711
COMM	Mean	0	0	1,115	1,583
	Standard Dev	0	0	234	265
IND	Mean	0	0	0	0
	Standard Dev	0	0	0	0
PUB	Mean	0	0	0	0
	Standard Dev	0	0	0	0
AUTO	Mean	427	1,369	2,470	1,748
	Standard Dev	622	1,203	1,681	1,477
EMERG	Mean	234	678	1,142	3,681
	Standard Dev	384	687	827	2,115

(b) Annual Damage – Future Without-Project Conditions

Future development was estimated to occur through the full build out (year 2020) for the Milpitas Midtown area. Future hydrology was evaluated and the change in flow was determined to be insignificant. Therefore, all increases in EAD under future conditions were attributable to future growth. Both existing and future EAD estimates are displayed in Table 2.14. The average annual equivalent represents the present value of future damages amortized over the 50-year period of economic analysis at the Federal discount rate of 5.375 percent.

Table 2.14 Average Annual Equivalent Damages – Future Without-Project Conditions

($1,000s – October 2004 Prices, 50-Year Period of Analysis)

Damage Category	Expected Annual Damages			Average Annual Equivalent at 5.375%
	Existing	**Future Midtown**	**Total EAD Future (2020)**	
Single Family Residential	1,147	0	1,147	1,147
Multi-Family Residential	419	66	485	460
Commercial	1,020	13	1,032	1,028
Industrial	7,304	0	7,304	7,304
Public	164	0	164	164
Automobile	162	44	206	188
Emergency	93	21	114	106
Roads	46	0	46	46
Total EAD	**10,355**	**144**	**10,499**	**10,444**

(c) Project Performance

In addition to damages estimates, HEC-FDA reports flood risk in terms of project performance. Three statistical measures are provided, in accordance with ER 1105-2-101, to describe performance risk in probabilistic terms. These include annual exceedance probability, long-term risk, and conditional non-exceedance probability by events.

- Annual exceedance probability measures the chance of having a damaging flood in any given year
- Long-term risk provides the probability of having one or more damaging floods over a period of time
- Conditional non-exceedance probability indicates the chance of not having a damaging flood given a specific event

Table 2.15 presents the project performance results for each impact area.

Table 2.15 Project Performance - Without-Project Conditions

Economic Impact Area	Annual Exceedance Probability	Long-Term Risk			Conditional Non-Exceedance Probability by Events			
		10-Year Period	**25-Year Period**	**50-Year Period**	**10%**	**2%**	**1%**	**0.2%**
A	0.040	33%	64%	87%	97%	23%	6%	1%
B	0.108	68%	94%	99%	51%	1%	0%	0%
C	0.047	38%	70%	91%	95%	14%	3%	0%
D	0.107	68%	94%	99%	51%	1%	0%	0%
E	0.117	71%	96%	99%	52%	1%	0%	0%
F	0.133	76%	97%	99%	43%	0%	0%	0%

3.4.1.2 Channel Modification

(a) Rectangular Concrete Channel

This alternative proposed rectangular concrete-lined channels for the length of the project, except for the greenbelt, where a trapezoidal concrete-line channel was proposed. This plan was determined to be economically justified and carried forward for further analysis.

(b) Rectangular Concrete Channel with Articulated Concrete Matting

This alternative is similar to the plan described above, with the exception of the use of articulated concrete matting through the greenbelt area. This was eliminated from further consideration after it was determined that the design floodwater velocities exceeded those allowed by the matting.

(c) Earth Channel

This alternative proposed an earthen channel for the length of the project. Real estate constraints made this alternative physically infeasible and economically unjustified.

(d) Combination Channel

A combination of trapezoidal concrete and earthen channels was found to be economically unjustified due to the significant real estate requirements.

3.4.2 Authorized Plan

This section describes the plan that was recommended in the 1987 Feasibility Report and which subsequently became the Authorized Plan. The Rectangular Concrete Channel Plan was reexamined, and two additional channel modification plans were reformulated and carried forward into the final array of alternatives. Similar to the Rectangular Concrete Channel Plan, both modified plans proposed a reinforced concrete-lined sedimentation basin with an earth bottom in a 500-foot reach immediately upstream of Old Piedmont Road, where it would transition to a box culvert under the road. However, the Rectangular Concrete Channel Plan proposed that a rectangular reinforced concrete-lined channel would lead out of the culvert and continue to the existing 400-foot-long box culvert under the intersection of Piedmont Road and Cropley Avenue, whereas the modified plans propose a trapezoidal reinforced concrete-lined channel. Furthermore, the first modified plan, Trapezoidal Concrete Channel Plan and Slope Protection, proposed offset levees utilizing the existing levees wherever possible along the length of the greenbelt as well as channel slope protection, in the form of riprap or gabions, to stabilize the creek banks in a number of locations. Similarly, the second modified plan, Trapezoidal Concrete Channel Plan, propose augmentation of existing and levees; however, it does not have the slope protection component. All three plans include a planting program for the establishment of two trees for each riparian tree impacted or removed by the project construction. The three proposed flood protection plans achieve economic optimization by providing 100-year protection against flooding from Berryessa Creek. However, the plan with the greatest net benefits was the

Trapezoidal Concrete Channel Plan, and was designated as the Recommended Plan (USACE, 1989). This plan was subsequently authorized for construction in the Water Resources Development Act of 1990.

3.6.3 Refinement of Measures by Reach

Refinement of measures took place to eliminate those that were (1) inappropriate for Federal participation or unsupported by non-Federal sponsorship, (2) had little to no potential for meeting study objectives, or (3) were less productive compared to other, more efficient elements. Measures eliminated from further study, therefore, included the following:

- Extensive use of concrete channels – due to lack of support by non-Federal sponsor, public, and resource agencies.
- Non-structural measures such as widespread buy-out within the floodplain and individual floodproofing – due to cost inefficiency. However, emergency response and preparedness information would in fact provide a viable component of any of the alternatives in order to help control ingress and egress, as well as provide assistance to those that are caught within flooded areas, and will therefore be carried forward.
- Detention/retention basins – due to inability to reduce peak flooding in available locations due to limited basin volume. Also, a large sediment basin upstream of Old Piedmont Road, for example, that would efficiently trap a majority of course sediment would likely cause downstream degradation, and is not compatible with the alluvial bed through the Greenbelt reach.
- Bypass channel/box culvert - due to existing infrastructure adjacent to the creek or within the right-of-way of Cropley Avenue.
- Plantings in channel bottom – due to increased channel capacity that would be required.

The effectiveness of the various management measures was then considered on a reach-by-reach basis in order to begin the process of identifying how the measures could be grouped into preliminary alternatives. The following list provides these refined measures that are developed into preliminary alternatives in the subsequent section.

3.6.3.1 Reach 9. Upstream of Old Piedmont Road

- Sediment source prevention/reduction by protective actions at the mine/quarry, hillside erosion areas, and bank erosion sites.
- Add seasonal aquatic habitat features, cascades, and pools.

3.6.3.2 Reach 8. Cropley Avenue Culvert to Old Piedmont Road

- Retrofit Old Piedmont Road Bridge by installing upstream levees and headwalls.
- Replacement of Old Piedmont Road Bridge.
- Concrete rectangular channel with service road remaining on the left bank.
- Widened trapezoidal channel with terrace for service road on left side. Geotech mats w/ grass to lined sideslopes and soft/earthen bottom.
- Clean out Cropley Avenue Culvert of sediment, maintain between events, add retaining/ headwall at upstream face for efficiency and safety.
- Add a second barrel to Cropley Avenue Culvert.

3.6.3.3 Reach 7. Greenbelt Park to Cropley Avenue Culvert

- Clean out and maintain existing sediment basin immediately downstream of Cropley Avenue culvert.
- Enlarge sediment basin immediately downstream of Cropley Avenue culvert.
- Increase height of levees on one or both sides to pass design flows with reasonable certainty. Pave service roads.
- Replace riparian invasive species with native species, including grasses, trees, etc.
- Improve channel to more natural status including adding bank stability, cover, and creation of aquatic habitat.
- Develop seasonal wetland area in floodplain with stream connection. Excavated materials are used for increasing height of service roads.

3.6.3.4 Reach 6. Morrill Avenue to Greenbelt Park

- Replacement of pedestrian bridge at Messina Drive to maintain pedestrian access due to impacts from increased upstream channel conveyance.
- Replace existing drop structure upstream of Sierra Creek and replace with rock weirs for fish passage.
- Increase height of levees on one or both sides to pass design flows with reasonable certainty. Pave service roads.
- Replace riparian invasive species with native species, including grasses, trees, etc.
- Improve channel to more natural status including adding bank stability, cover, and aquatic habitat.

- Develop seasonal wetland area in floodplain with stream connection. Excavated materials are used for increasing height of service roads.

3.6.3.5 Reach 5. Highway 680 to Morrill Avenue

- Develop levees or similar means to funnel Cropley Avenue overflows directly back into Berryessa Creek to minimize damage to residential structures.
- Replace concrete channel segment with lined trapezoidal channel with grass-filled geotech mats and earthen bottom.
- Pave existing service roads.

Figure 5-1 Berryessa Creek Habitat –Upstream of Old Piedmont Road to Greenbelt Reach

Figure 5-2 Berryessa Creek Habitat – Enlargement of Upstream of Old Piedmont Road

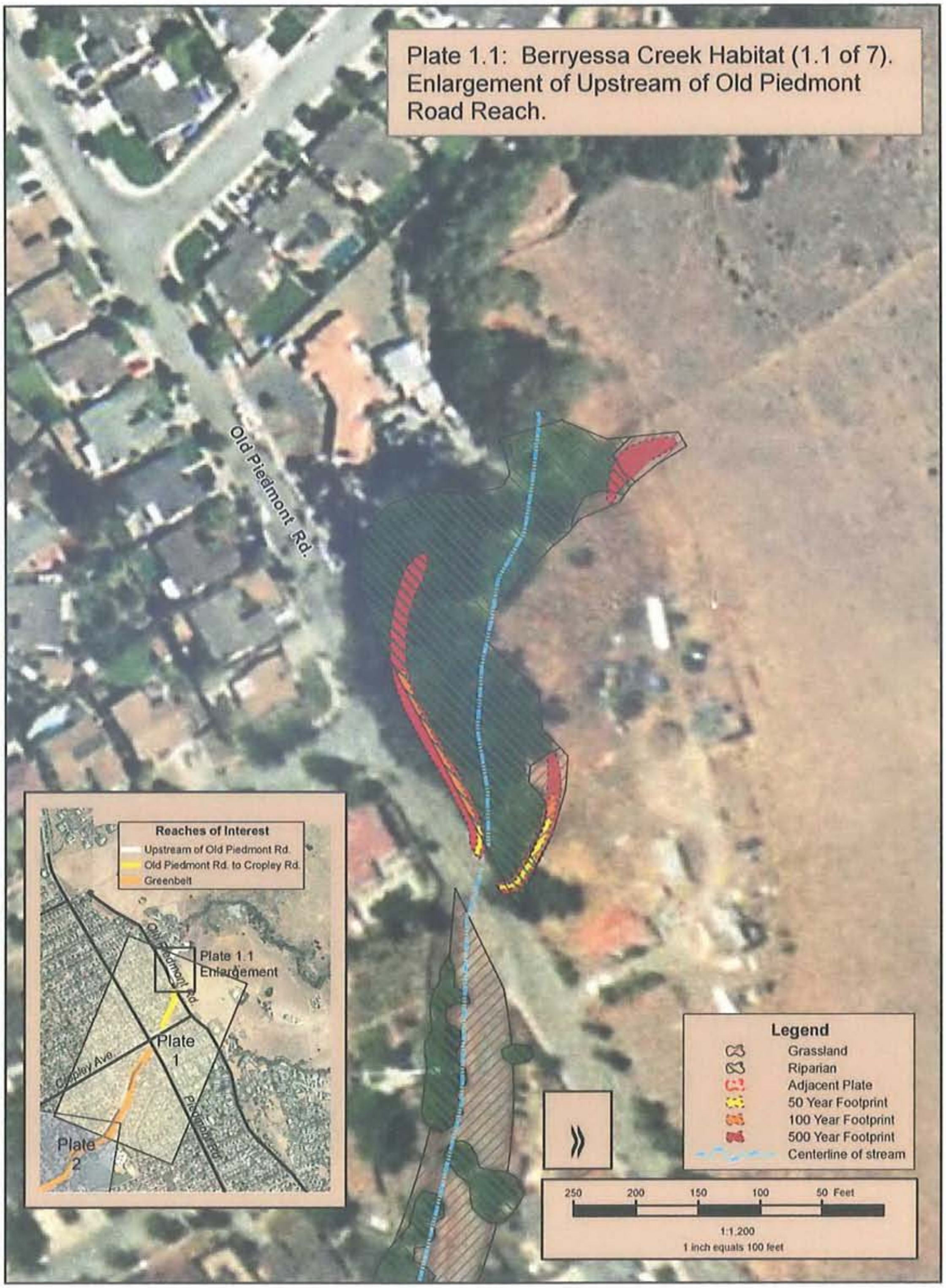


Figure 5-3 Berryessa Creek Habitat – Greenbelt Reach

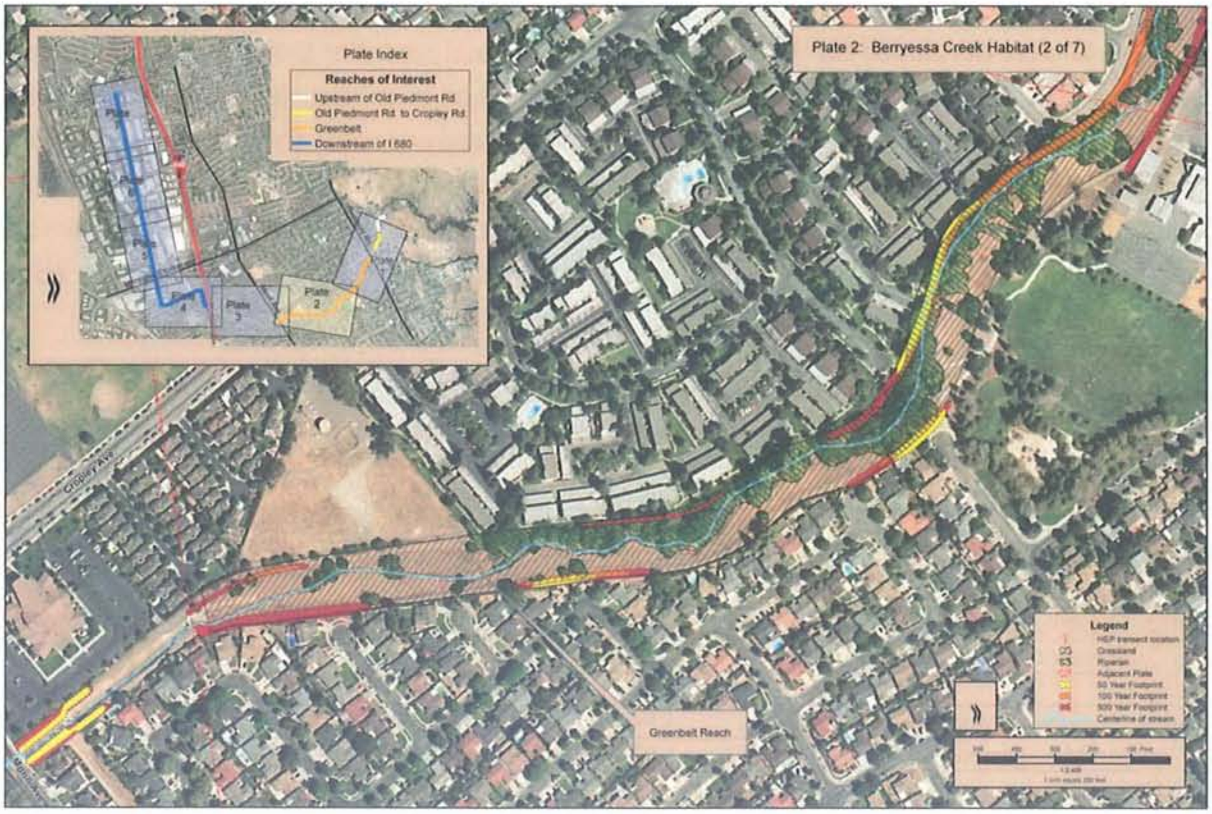


Figure 5-4 Berryessa Creek Habitat – Morrill Avenue to Upstream of I-680

6.2.4 Costs

Project costs were developed for the six alternative plans analyzed. For the purposes of comparing costs to benefits, the latter of which are typically presented on an average annual basis, the costs have been amortized over the projected 50-year period of analysis using the current Federal discount rate of 5.375 percent to yield an annual cost. Interest during construction was based on a two-year construction schedule assuming uniform expenditures over the period. Annual cost estimates are shown in Table 6-3 for Alternative 2A, 3A, and 4A; annual cost estimates for Alternatives 2B, 3B, and 4B are presented in Table 6-4.

Table 6-3 Annual Costs – Alternative 2A, 3A, and 4A

In $1,000s, October 2005 Prices
Based on a 50-year Period of Analysis
(Discounted using 5.375% Interest Rate)

	Alternative 2A	Alternative 3A	Alternative 4A
Environmental Mitigation[1]	87	80	80
Environmental Design Costs[1]	0	293	370
All other Construction Costs	12,843	15,178	18,400
Total Construction Costs	12,930	15,551	18,850
Contingency	3,879	4,665	5,655
Planning, Engineering and Design	1,940	2,333	2,828
Construction Management	1,034	1,244	1,508
LERRDs	33	22,145	33
First Costs	**19,816**	**45,938**	**28,874**
Interest During Construction	2,833	6,568	4,128
Investment Costs	22,649	52,506	33,002
Interest & Amortization	1,313	3,044	1,913
OMRR&R	122	128	132
Annual Costs	*1,435*	*3,173*	*2,045*

[1] These costs are from Section 5.4 of this report and are a subset of the total construction costs found in Appendix B, Part IV.

Table 6-4 Annual Costs – Alternative 2B, 3B, and 4B

In $1,000s, October 2005 Prices
Based on a 50-year Period of Analysis
(Discounted using 5.375% Interest Rate)

	Alternative 2B	Alternative 3B	Alternative 4B
Environmental Mitigation[1]	133	125	125
Environmental Design Costs[1]	0	294	370
All other Construction Costs	20,612	22,560	26,395
Total Construction Costs	20,745	22,979	26,890
Contingency	6,224	6,894	8,067
Planning, Engineering and Design	3,112	3,447	4,033
Construction Management	1,660	1,838	2,151
LERRDs	3,409	22,342	213
First Costs	**35,150**	**57,500**	**41,354**
Interest During Construction	5,025	8,221	5,912
Investment Costs	40,175	65,721	47,226
Interest & Amortization	2,329	3,810	2,741
OMRR&R	131	138	140
Annual Costs	*2,460*	*3,948*	*2,881*

1. These costs are from Section 5.4 in this report and are a subset of the total construction costs found in Appendix B, Part IV.

6.2.5 Net Benefits

Economic efficiency is based on the alternative with the greatest return on investment, as measured by annual net benefits. Annual net benefits are determined as the difference between the annual benefits and the annual costs of an alternative. The alternative that offers the greatest net benefits is known as the National Economic Development (NED) Plan. Table 6-5 shows net benefits and the benefit-to-cost ratio for each alternative.

Table 6-5 Annual Benefits and Costs by Alternative

In $1,000s, October 2005 Prices
Based on a 50-year Period of Analysis
(Discounted using 5.375% Interest Rate)

	Benefits and Costs					
	Alternative 2A	**Alternative 2B**	**Alternative 3A**	**Alternative 3B**	**Alternative 4A**	**Alternative 4B**
Annual Benefits	10,232	10,953	10,232	10,953	10,232	10,953
Annual Costs	1,435	2,460	3,173	3,948	2,045	2,881
Net Benefits	8,797	8,493	7,059	7,005	8,187	8,702
B/C Ratio	**7.1**	**4.5**	**3.2**	**2.8**	**5.0**	**3.8**

6.4 IDENTIFICATION AND RATIONALE FOR SELECTION OF RECOMMENDED PLAN

Following the incremental analysis detailed in Section 3.7.2.1 and specifically shown in Table 3-7 and Table 3-8, the project performance that most reasonably appeared to provide the maximum NED benefits was the 0.01 (1 percent) exceedance probability event for the entire project reach. As described above, plans were therefore formulated to provide that level of conveyance for the three main alternatives, 2A, 3A, and 4A. In addition, a level of conveyance consistent with FEMA certification requirements was also formulated for the three main alternatives so that 2B, 3B, and 4B would convey the median discharge associated with the 0.002 (0.2 percent) exceedance probability event without uncertainty, which roughly corresponds to the 0.01 event with a confidence level of at least 95 percent.

The plan formulation process proceeded with the hydraulic design of the channels, flow routing to identify breakouts, floodplain identification, and the assessment of annual damages prevented and annual costs leading to benefit/cost ratios for the six alternatives.

As shown in Table 6-5 above, the analysis indicates that the preliminary NED Plan is Alternative 2A (earthen leveed/incised channel conveying the 0.01 conditional non-exceedance probability event) with average annual net benefits of $8,797,000 and a benefit-to-cost ratio of 7.1.

A Locally Preferred Plan (LPP) may be identified in the GRR/EIS-R if the results of a Public Meeting and further coordination efforts indicate that a plan other than the NED Plan is favored by local stakeholders. When the LPP is clearly of lesser scope and cost and meets the Administration's policies for high-priority outputs, the Assistant Secretary for the Army (ASA) usually grants an exception for deviation. The increased scope of any plan, more expensive than the NED Plan, would not warrant Federal cost-sharing participation. Thus, if the LPP is larger in scope than the NED Plan, the local sponsor would pay 100 percent of the difference between that plan and the NED Plan.

The SCVWD is currently coordinating the identification of a LPP with the local community. It is anticipated that an LPP will be identified at the F4A Conference.

6.4.1 Design Refinements

The following refinements to the preliminary NED Plan would be addressed during the design effort leading to the preparation of the Draft GRR/EIS/R.

6.4.1.1 Safety Railing

A 42-inch high fall-protection barrier/railing would be added along vertical walls where there is greater than an 18-inch vertical drop.

6.4.1.2 Second Maintenance Road

A secondary maintenance road would be added to the channel where required in order to allow access from both sides of the channel. Where space is a constraint, the maintenance road would be within the channel along the channel bank, above at least the 5-year water surface elevation. This additional maintenance road is not expected to increase the right-of-way requirements.

6.4.1.3 Purchase of UPRR Rights-of-Way

The UPRR bridges crossing the channel are currently formulated to be removed and replaced to provide flow conveyance. Coordination with the Santa Clara Valley Transportation Authority (VTA) is taking place to identify cost effectiveness of purchasing the bridge and spur rights-of-way to avoid rebuilding these bridges. Currently, the planning process is proceeding with the bridges expected to be rebuilt pending the results of further coordination with VTA.

6.4.1.4 Sediment Transport / Geomorphic Refinements

Appendix B, Part III, "Geomorphic and Sediment Transport Assessment," indicates several technical issues that, while not expected to affect plan selection, are important features to be considered during the design of the Recommended Plan. These include:

- Refinement of the sediment basin configuration to avoid the problem of sedimentation into the Piedmont box culvert. This could include (1) regrading the basin to develop a steeper

slope immediately downstream of the culvert outlet, (2) altering the culvert invert to have a "V-bottom" to help concentrate flows and increase transport capacity during low flows, and (3) moving the basin or extending it a short distance downstream.

- To further reduce the possibility of plugging of the culvert, an installation of a debris fence should be investigated immediately upstream of the culvert inlet to catch large boulders and debris that could potentially be transported from upstream.
- Consideration of variations in velocities and sheer stresses that can cause localized sedimentation and scour problems, including depositional potential at Calaveras.
- Incorporation of features to facilitate removal of deposited sediments upstream of Montague Expressway due to reduction in velocities and shear stresses within the reach.

In addition, a potential design modification for the greenbelt area was suggested following the Alternatives Review Conference. This design would provide a geomorphic floodplain cross-section from downstream of the Piedmont/Cropley sediment basin to upstream of the Morrill drop structure, a distance of approximately 4,000 feet. The existing channel design would be modified to provide a terrace floodplain section approximately 20 feet wide and 3 feet lower than the existing ground on the left overbank, and would be approximately 2 feet above the existing channel bed elevation. This modification would provide a more natural cross-section to provide an active floodplain within the existing right-of-way in this area for flows above the 1- to 1.5-year event. Rough initial costs appear to be approximately $400,000 due to increased excavation and protection of existing trees within the floodplain area against scour.

Attachment B

Cost Estimates – Preliminary Cost Estimates for the Upper Berryessa Creek Project for Reaches 5, 6, 7, 8, and 9, including Reaches 6A & 7A (Cropley Avenue Concrete Bypass Box Culvert).

Upper Berryessa Creek - Upstream of Interstate 680					
Upper Berryessa Creek - Reaches 5, 6, & 7					
Reach 5 - Interstate 680 to Morrill Avenue	Existing Earthen Trapezoidal Channel				3000 LF
Reach 6 - Morrill Avenue to Secondary Sediment Basin	Existing Channel Conc. Drop Struct/Secondary Sediment Basin				750 LF
Reach 7 - Secondary Sediment Basin to Piedmont Road	Existing Floodplain Channel Meander (Greenbelt Area)				5000 LF
	Qty	Unit	Unit Cost	Cost	
1. Physical Site Work Construction					
Clear & Grub	2.5	AC	$ 15,000	$ 37,500	
Earthwork					
Excavation of earthened channel thalweg	10000	CY	$ 40	$ 400,000	
Excavation of exist Cropley/Piedmont sediment basin	5000	CY	$ 40	$ 200,000	
Miscellaneous Site Work					
Aggregate Maintenance Road	7500	CY	$ 60	$ 450,000	
Erosion Control Hydroseeding	2.5	AC	$ 2,000	$ 5,000	
Misc Fencing (Replace Damaged Fencing/Gates		LS	$ 50,000	$ 50,000	
Control of Water		LS	$ 50,000	$ 50,000	
Cropley Avenue Bridge Replacement (Assumes Cropley Ave Bypass Box eliminates replacement)				$0.0	
Morrill Avenue Bridge Replacement (Assumes Cropley Ave Bypass Box eliminates replacement)				$0.0	
Subtotal Site Construction				$ 1,192,500	
Estimating Contingency	30%			$ 357,750	
Construction Management (Contractor)	10%			$ 119,250	
Mobilization, On-site BMPs, etc.	10%			$ 119,250	
Construction Contract Cost				$ 1,788,750	
2. Right of Way costs				$0.0	
Subtotal Construction and ROW				$ 1,788,750	
3. District Costs					
Planning	20%			$ 357,750	
Design	15%			$ 268,313	
Environmental Review, CEQA (assume no mitigation)	10%			$ 178,875	
Geotechnical/Hydraulic Analysis and for FEMA cert.	10%			$ 178,875	
District Construction Inspection, CM, Engr. Support	10%			$ 178,875	
Total District Costs				$ 1,162,688	
Total Upper Berryessa Creek - Reaches 5, 6, & 7				**$ 2,951,438**	

Upper Berryessa Creek - Upstream of Interstate 680 Upper Berryessa Creek - Reaches 6A & 7A						
Reach 6A - Cropley Bridge to Messina Drive	Cropley Avenue Bypass Box Culvert with outlet structure				3100	LF
Reach 7A - Messina Drive to Piedmont Road	Cropley Avenue Bypass Box Culvert with inlet structure				2500	LF
	Qty	Unit	Unit Cost	Cost		
1. Physical Site Work Construction						
Clear & Grub (Asphalt Concrete Removal & Disposal)		LS	$ 100,000	$ 100,000		
Earthwork						
Excavation of bypass box culvert	40000	CY	$ 35	$ 1,400,000		
Concrete for bypass box culvert	9,500	CY	$ 400	$ 3,800,000		
Asphalt Concrete Pavement	3,800	TON	$ 125	$ 475,000		
Traffic Control		LS	$ 250,000	$ 250,000		
Signage and Striping		LS	$ 50,000	$ 50,000		
Utility Replacement/Coordination		LS	$ 500,000	$ 500,000		
Control of Water		LS	$ 50,000	$ 50,000		
Misc Fencing (Replace Damaged Fencing/Gates		LS	$ 50,000	$ 50,000		
Bay Division Pipeline at Piedmont Rd (Assumes bypass box culvert design cannot avoid pipeline)				$2,000,000		
Subtotal Site Construction				$ 8,675,000		
Estimating Contingency	30%			$ 2,602,500		
Construction Management (Contractor)	10%			$ 867,500		
Mobilization, On-site BMPs, etc.	10%			$ 867,500		
Construction Contract Cost				$ 13,012,500		
2. Right of Way costs				$0.0		
Subtotal Construction and ROW				$ 13,012,500		
3. District Costs						
Planning	20%			$ 2,602,500		
Design	15%			$ 1,951,875		
Environmental Review, CEQA (assume no mitigation)	10%			$ 1,301,250		
Geotechnical/Hydraulic Analysis and for FEMA cert.	10%			$ 1,301,250		
District Construction Inspection, CM, Engr. Support	10%			$ 1,301,250		
Total District Costs				$ 8,458,125		
Total Upper Berryessa Creek - Reaches 6A & 7A				**$ 21,470,625**		

Upper Berryessa Creek - Upstream of Interstate 680				
Upper Berryessa Creek - Reaches 8 & 9				
Reach 8 - Piedmont Road to Old Piedmont Road	Armor banks and invert to withstand 15 fps			600 LF
Reach 9 - Old Piedmont Road to 600 Feet Upstream	Replace Old Piedmont Bridge			600 LF
	Qty	Unit	Unit Cost	Cost
1. Physical Site Work Construction				
Clear & Grub	1.0	AC	$ 15,000	$ 15,000
Earthwork				
Excavation of earthened channel	5000	CY	$ 40	$ 200,000
Miscellaneous Site Work				
Aggregate Maintenance Road	550	CY	$ 60	$ 33,000
Erosion Control Hydroseeding	1	AC	$ 2,000	$ 2,000
Misc Fencing (Replace Damaged Fencing/Gates		LS	$ 50,000	$ 50,000
Control of Water		LS	$ 50,000	$ 50,000
Demolition & Disposal of Existing Old Piedmont Bridge		LS	$ 100,000	$ 100,000
Old Piedmont Bridge Replacement		LS	$ 1,000,000	$ 1,000,000
Traffic Control		LS	$ 100,000	$ 100,000
Signage and Striping		LS	$ 20,000	$ 20,000
Utility Replacement/Coordination		LS	$ 100,000	$ 100,000
Subtotal Site Construction				$ 1,670,000
Estimating Contingency	30%			$ 501,000
Construction Management (Contractor)	10%			$ 167,000
Mobilization, On-site BMPs, etc.	10%			$ 167,000
Construction Contract Cost				$ 2,505,000
2. Right of Way costs				$0.00
Subtotal Construction and ROW				$ 2,505,000
3. District Costs				
Planning	20%			$ 501,000
Design	15%			$ 375,750
Environmental Review, CEQA (assume no mitigation)	10%			$ 250,500
Geotechnical/Hydraulic Analysis and for FEMA cert.	10%			$ 250,500
District Construction Inspection, CM, Engr. Support	10%			$ 250,500
Total District Costs				$ 1,628,250
Total Upper Berryessa Creek - Reaches 8 & 9				**$ 4,133,250**

Alamitos Creek Levee Upgrade

PROJECT PROPOSAL

Prepared By:
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Approved By:

Melanie Richardson Date
Deputy Administrative Officer
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I. PROJECT BACKGROUND

A. Why do this Project?

This Project is proposed to upgrade the levees and floodwalls along Alamitos Creek between Almaden Lake and Harry Road, to meet current FEMA standards for 1% protection. The proposed work intends to remove approximately 1,100 nearby parcels from the current FEMA 1-percent regulatory floodplain.

B. History & Background

The existing levees and floodwall were constructed in 1981 to protect residents from the risk of flooding, up to the 1% flood event. In 1986, FEMA published new freeboard standards and the project did not meet the new standards for levee certification. As a result, the adjacent neighborhood has been mapped into the FEMA regulatory floodplain, with associated regulatory and flood insurance requirements. The project is now 30 years old, and a rehabilitation to meet current flood protection standards has been proposed.

Because the existing project provides 1% protection, but not to current FEMA standards, an economic analysis was performed in 2011 assuming the existing conditions provide protection to the 95-year return-period flood event. Using the most recent published FEMA 1% floodplain (2009), the FEMA damage-estimation model HAZUS calculates 1% flood damages at $51,000,000, which leads to calculated average annual damages of $1,000,000.

II. PROJECT OBJECTIVES

- Provide 1-percent flood protection for Alamitos Creek from Almaden Lake to Harry Road to meet current FEMA criteria.
- Modify bridge and levees at Graystone Lane to meet FEMA standards for freeboard
- Modify or raise pedestrian bridge downstream of Graystone Lane to meet FEMA standards for freeboard
- Clarify which parcels will obtain 1-percent flood protection by this project and obtain a letter of Map Revision (LOMR) from FEMA that reflects the new condition.
- Preserve the existing trails, open space and habitat elements
- Identify opportunities for environmental enhancement, such as stream restoration, trails, parks, and open space, for Board consideration.
- Provide maintenance guidelines for the updated project

III. PROJECT CRITERIA / CONSTRAINTS / ASSUMPTIONS

A. Criteria

- Provide 1-percent flood protection satisfying current FEMA standards.
- Obtain rights of way at least 6 months prior to the construction of each reach.
- Perform structural design work as per AISC standards.
- Coordinate utility relocation work as per District's and external agency's standards. District staff will be coordinating utility relocation work, which may include City of San Jose, San Jose Water Company, SBC Communications (Pacific Bell), Pacific Gas and Electric Company, various fiber optic and cable companies, etc.
- Conform to regulatory stipulations set forth by the Corps of Engineers Section 404 Permit, California Regional Water Quality Board's Section 401 Permit, and California Department of Fish and Game's Section 1601 Streambed Alteration Agreement.

B. Constraints

- Funding source for the project has to be determined.
- Design and coordination of utility relocations for each reach must be addressed and fully evaluated prior to construction of the main channel improvements.
- The Almaden Valley Pipeline runs parallel to, and possibly within, existing levees in the project area.

C. Assumptions

- Appropriate permits will be obtained during the project's design phase.
- Cost for utility work has been estimated as 5% of the construction cost
- The project will require 4.2 Acre of ROW acquisition from Harry Road to Almaden Lake.
- There is no federal interest for the project.
- Bridge work will be required.
- The Guadalupe Watershed Integration Working Group (GWIWG) will be the forum to discuss and resolve permit conditions for the project.

IV. PROJECT SCOPE OF WORK

Estimated Construction Activities

As a preliminary analysis, a HEC-Ras model was run for the 1% design flood flow. Attachment A provides the resulting table that compares the computed water surface elevation to the surveyed top-of-bank, levee or floodwall, as appropriate. This information was used to define where additional levee or floodwall height or bridge work would be needed to meet FEMA standards. Attachment B provides a schematic drawing that indicates the locations of existing floodwalls and levees, and where additional work will be required to provided needed freeboard height. More detailed

engineering work for this project will more accurately define the required work. The preliminary cost estimates provided with this Proposal (Attachment C) are based on the initially-defined needs, which are summarized below:

Additional Levee Height Needed

In the roughly 3 ½ miles between Lake Almaden and the Camden Avenue crossing, approximately 3,500 linear feet of levee would be raised by up to two feet, with another 3,500 linear feet needing to be raised between two and four feet. This work would primarily occur on the right side of the creek (looking upstream).

Upstream of Camden Avenue to Harry Road, approximately 1,800 linear feet of levee (including both sides of the creek) would need to be raised up to two feet.

Additional Floodwall Height Needed

In the approximately two mile stretch between Lake Almaden and the Graystone Lane crossing, approximately 2,150 linear feet of floodwall would need to be increased by up to two feet in height. An additional 900 linear feet would need to be raised between four and seven feet. This work is needed only on the right side of the creek.

No additional floodwalls are anticipated upstream of Graystone Lane, unless levee-raising is not feasible, in which case additional required freeboard height may be provided with floodwalls atop existing levees.

Bridgework

To meet FEMA standards, initial estimates assume that the Graystone bridge would be replaced or substantially renovated. Additionally, the pedestrian bridge downstream of Graystone Road would be raised.

Details on the locations of the levee and floodwall work are provided in Attachment A – Freeboard Requirements and Locations; and Attachment B – Schematic Overview.

Planning, Design and Management

The scope of this project includes implementation of planning, design, construction and closeout phases, including submitting documentation for a Letter of Map Revision from FEMA. The most recently updated QEMS procedures will be followed during execution of each phase.

A. Planning Phase.

- Identify the problems and issues.
- Evaluate and potentially expand on current feasible alternatives.
- Initiate geotechnical work to provide foundation for levee/ floodwall raising and for Letter of Map Amendment application to FEMA
- Formulate recommended project.
- Perform appropriate public outreach
- Prepare Engineers Report and appropriate CEQA document.

B. Design Phase.

- Obtain rights of way.
- Determine and develop remediation protocols for hazardous sites and include with plans and specifications.
- Develop plans and specifications for advertisement and award of the construction contract.
- Coordinate utility work with pertinent owners.
- Identify and obtain necessary permit(s) from pertinent owner(s).
- Perform appropriate public outreach.
- Coordinate the design with GWIWG.
- Obtain appropriate permits from regulatory agencies.
- Prepare Operations and Maintenance manual for channel improvements.

C. Construction Phase.

- Construct the project.
- Perform appropriate public outreach.
- Manage construction contract.

D. Close-out Phase.

- Complete as-built drawings.
- Close all contracts and agreements with accounting and contract office.
- Conduct close-out meetings and all other requirements identified in the Capital Project Delivery Procedure Q751D01, including submitting all required documents for a Letter of Map Revision (LOMR) from FEMA

A. PROJECT DURATION AND COSTS

Project Cost Scheduling

Alamitos Numbers in Thousands of Dollars

	MAJOR WORK ELEMENT	FY 1*	FY 2	FY 3	FY 4	FY 5	FY 6	FY 7	Total
Planning	1207 Project Management	*200*	*200*	*200*	-	-	-		600
	1290 Planning Study (Incl. Geotech Study)	*3,200*	*2,200*	*2,100*	-				7,500
Design	1321 Environmental Review/Regulatory Permit Acquisitions	*1,000*	*1,000*	*1,400*	500			400	4,300
	1407 Project Management			100	200	200	200		700
	1493 Design & PS&E		500	1,400	1,500	700	200		4,300
	1531 Land Acquisition			5,000	5,000	10,000	4,000		24,000
Construction	1607 Project Management				50	100	100	100	350
	1665 Construction Management and Engineering Support				100	400	400	200	1,100
	1660 Construction					5,700	8,000	5,000	18,700
Close-Out	1907 Project Management						75	75	150
	1689 LOMR Submittal						100	100	200
	Total Costs by Fiscal Year	4,400	3,900	10,200	7,350	17,100	13,075	5,875	61,900
	Accumulated Costs	4,400	8,300	18,500	25,850	42,950	56,025	61,900	61,900

*FY1 is planned to be 201X.

VI. SOURCES OF FUNDING

A. District Fund(s)

A source of funding for this project has not been identified.

B. Potential Cost-sharing

Currently there is no cost sharing opportunity for this project.

VII. OPERATING BUDGET IMPACTS

This project will incur similar operations and maintenance costs as the current condition. New maintenance costs are not anticipated.

VIII. ESTIMATED LIFE CYCLE

The estimated project life is 50 years (to be verified during the design phase).

IX. ATTACHMENTS

A **Freeboard Requirements and Locations** – Results of HEC-Ras model, compared to FEMA freeboard requirements, identifying areas that will need additional freeboard and how much

B **Schematic Overview–** Simplified plan view of Alamitos Creek with historic stationing; marked schematically with locations of existing levees and floodwalls and proposed levee, bridge and floodwall work. The approximate location of the Almaden Valley Pipeline is also schematically provided.

C **Cost Estimates**

D **Right-of-Way Estimates**

E **Map of 1% Floodplain** (adapted from FEMA Digital Flood Insurance Rate Map, 2009)

Attachment A

Freeboard Requirements and Locations – Results of HEC-Ras model, compared to FEMA freeboard requirements, identifying areas that will need additional freeboard and how much

HEC-RAS model: Alamitos099.prj

Alamitos Creek

River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	L. High Bank	L. Freebd (ft)	Rqd FEMA Freebd (ft)	Rqd Extra L. Freebd (ft)	R. High Bank	R. Freebd (ft)	Rqd FEMA Freebd (ft)	Rqd Extra R. Freebd (ft)
18740	4750	287	294.1	299.8	5.75			299.8	5.75		
18590	4750	286	291.8	300.0	8.24			299.4	7.64		
18400	4750	283	290.9	296.0	5.08			291.0	0.08		***
18132	4750	281	287.4	290.0	2.58			299.0	11.58	3.00	
17855	4750	278	285.9	290.0	4.13			299.5	13.63	3.00	
17755	4750	276.5	285.6	290.0	4.38			300.0	14.38	3.00	
17655	4750	276	285.5	311.0	25.52			300.0	14.52	3.00	
17422	6750	272.8	284.5	300.0	15.48			297.0	12.48	3.00	
17222	6750	271.2	283.5	290.0	6.52			300.0	16.52	3.00	
17012	6750	270.5	282.7	290.0	7.30			302.5	19.80	3.00	
16812	6750	270	281.5	286.0	4.47			302.0	20.47	3.00	
16612	6750	268	279.6	286.0	6.36			297.0	17.36	3.00	
16555	6750	267	279.0	280.0	1.03			292.5	13.53	3.00	
16361	6750	266	277.6	278.0	0.41			289.0	11.41	3.00	
16232	6750	265.5	276.9	278.0	1.10			286.5	9.60	3.00	
16035	6750	265	275.6	278.0	2.36			279.0	3.36	3.00	
15800	6750	262.5	274.2	276.0	1.78			274.7	0.48	3.00	2.5
15599	6750	261.5	273.1	285.0	11.90			273.5	0.40	3.00	2.6
15404	6750	260.5	272.2	285.0	12.85			272.5	0.35	3.00	2.6
15268	6750	261	271.7	284.0	12.26			271.7	-0.04	3.00	3.0
15077	6750	258.5	270.7	282.0	11.34			270.8	0.14	3.00	2.9
14841	6750	257.5	268.9	280.0	11.13			269.1	0.23	3.00	2.8
14692	6750	257	268.2	282.0	13.82			268.3	0.07	3.00	2.9
14553	6750	255.5	267.4	282.0	14.64			267.8	0.44	3.00	2.6
14308	6750	255.5	266.5	279.0	12.49			266.5	-0.01	3.00	3.0
14229	6750	255	266.2	279.0	12.83			266.5	0.33	3.00	2.7
14002	6750	252.8	265.5	276.0	10.48			265.8	0.28	3.00	2.7
13763	7380	250.5	263.6	276.0	12.37			265.0	1.37	3.00	1.6
13641	7380	250	262.9	272.0	9.07			264.0	1.07	3.00	1.9
13445	7380	246.5	262.0	272.0	10.01			263.0	1.01	3.00	2.0
13344	7380	249.5	261.2	270.0	8.77			262.5	1.27	3.00	1.7
13170	7380	246.5	260.1	272.0	11.90			261.5	1.40	3.00	1.6
13050	7380	246.5	259.4	272.0	12.59			260.5	1.09	3.00	1.9
12777	7380	244.5	257.5	270.0	12.49			259.0	1.49	3.00	1.5
12640	7380	244	256.0	270.0	13.99			257.5	1.49	3.00	1.5
12420	7380	243	253.9	267.0	13.12			255.5	1.62	3.00	1.4
12310	7380	240.5	253.6	266.0	12.37			255.0	1.37	3.00	1.6
12167	7380	241	252.8	260.0	7.25			254.5	1.75	3.00	1.3
11967	7380	239.5	252.0	260.0	7.98			254.0	1.98	3.00	1.0
11842	7380	238.5	251.9	260.0	8.13			254.0	2.13	3.21	1.1
11814	7380	238.1	251.7	260.0	8.28			254.0	2.28	3.50	1.2
11763	7380	238	251.0	252.5	1.51			252.5	1.51		
11720	7380	238	250.6	252.5	1.93			252.5	1.93		
11673	7380	238	248.7	250.0	1.34			253.0	4.34	3.53	
11343	7380	237.5	247.1	250.0	2.95			249.8	2.75	3.00	0.2
11306	7380	235.5	247.0	250.0	2.98			249.0	1.98	3.00	1.0
11119	7380	235.5	246.5	250.0	3.52			248.3	1.82	3.00	1.2
10858	7380	233.8	245.6	250.0	4.40			246.5	0.90	3.00	2.1
10600	7380	232.7	244.1	250.0	5.94			244.7	0.64	3.00	2.4
10496	7380	232.5	243.4	244.5	1.14	3.00	1.9	244.3	0.94	3.00	2.1
10350	7380	231.8	242.5	243.5	0.96	3.00	2.0	243.6	1.06	3.00	1.9
10166	7380	231.3	241.5	242.5	1.05	3.00	1.9	242.5	1.05	3.00	1.9
9954	7380	228.7	240.1	241.0	0.88	3.00	2.1	241.0	0.88	3.00	2.1
9687	7380	227.7	238.8	239.0	0.23	3.00	2.8	239.8	1.03	3.00	2.0
9365	7800	227.5	237.1	238.2	1.08	3.00	1.9	238.3	1.18	3.00	1.8

HEC-RAS model: Alamitos099.prj

Alamitos Creek

River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	L. High Bank	L. Freebd (ft)	Rqd FEMA Freebd (ft)	Rqd Extra L. Freebd (ft)	R. High Bank	R. Freebd (ft)	Rqd FEMA Freebd (ft)	Rqd Extra R. Freebd (ft)
9124	7800	226.3	236.2	237.5	1.27	3.00	1.7	238.2	1.97	3.00	1.0
8938	7800	225	235.8	237.6	1.83	3.00	1.2	237.8	2.03	3.00	1.0
8843	7800	224.5	235.0	241.0	6.04			237.0	2.04	3.00	1.0
8660	7800	223	234.6	240.0	5.44			236.5	1.94	3.00	1.1
8400	7800	222	233.6	257.0	23.45			236.0	2.45	3.00	0.6
8220	7800	221.2	233.3	244.5	11.18			235.0	1.68	3.00	1.3
8028	7800	220	233.2	241.5	8.31			234.8	1.61	3.00	1.4
7750	7800	219	231.2	239.0	7.85			233.2	2.05	3.00	1.0
7659	7800	219	230.9	237.0	6.15			232.5	1.65	3.00	1.3
7559	7800	218	230.2	236.0	5.82			231.5	1.32	3.00	1.7
7442	7800	218	229.2	234.2	5.04			230.5	1.34	3.00	1.7
7225	7800	217	227.3	232.0	4.68			229.0	1.68	3.00	1.3
7078	7800	216.5	227.0	231.0	4.00			227.6	0.60	3.00	2.4
6810	7800	215.5	226.1	231.0	4.92			227.0	0.92	3.00	2.1
6619	7800	214	225.5	231.5	6.01			226.5	1.01	3.00	2.0
6427	7800	213	224.8	231.5	6.74			226.0	1.24	3.00	1.8
6306	7800	213.2	224.1	231.5	7.38			225.5	1.38	3.00	1.6
6200	7800	212.3	223.1	229.0	5.95			224.0	0.95	3.00	2.1
5985	7800	211	220.6	227.7	7.06			222.0	1.36	3.00	1.6
5787	7800	210	220.0	225.8	5.76			221.0	0.96	3.00	2.0
5592	7800	208.8	219.3	218.0	-1.32			219.5	0.18	3.00	2.8
5503	7800	207	219.3	220.0	0.68			218.0	-1.32		***
5403	7800	208	219.2	221.0	1.81			218.6	-0.59		***
5307	7800	206.5	218.1	219.0	0.91			217.0	-1.09		***
5157	7800	205.8	217.7	216.3	-1.41			216.8	-0.91		***
5020	7800	204.5	217.1	215.8	-1.34			216.5	-0.64		***
4900	7800	204	216.3	216.0	-0.27			216.0	-0.27		***
4805	7800	205	215.7	215.0	-0.65			216.0	0.35		***
4629	7800	204.2	214.8	213.6	-1.19			214.0	-0.79	3.00	3.8
4464	7800	202.6	213.2	217.5	4.33			212.8	-0.37	3.00	3.4
4343	7800	201.4	212.2	213.2	0.98			212.5	0.28	3.00	2.7
4229	7800	201.8	211.5	212.3	0.83			212.0	0.53		***
4228	7800	201.8	210.8	212.0	1.16			212.5	1.66		
4225	7800	201.8	210.3	212.0	1.73			212.5	2.23		
4222	7800	201.8	209.1	212.0	2.86			212.5	3.36		
4166	8680	192.5	198.4	212.0	13.60			212.5	14.10		
4022	8860	192	205.9	212.0	6.11			217.5	11.61		
3920	8860	192	204.9	208.0	3.12			208.0	3.12		
3889.5	Bridge										
3859	8860	192	204.7	208.0	3.27			208.0	3.27		
3810	8860	192	204.6	211.8	7.16			213.0	8.36		
3609	8860	191.5	204.2	212.2	7.97			209.0	4.77		
3383	8860	191.2	203.8	210.0	6.25			209.0	5.25		
3182	8860	191	203.5	217.0	13.53			208.0	4.53		
2963	8860	190.6	202.7	215.5	12.79			206.0	3.29		
2779	8860	190.2	202.2	211.0	8.76			205.0	2.76		
2553	8860	190	201.4	207.5	6.09			206.0	4.59		
2331	8860	189.5	200.6	206.0	5.38			205.5	4.88		
2234	8860	189.5	198.4	205.1	6.73			209.3	10.93		

- Denotes Floodwall
- Denotes Levee
- Denotes Bridge

HEC-RAS model: Alamitos099.prj

Alamitos Creek U/S

River Sta	Q Total	Min Ch El	W.S. Elev	L. High Bank	L. Freebd	Rqd FEMA Freebd	Rqd Extra L. Freebd	Gnd Elev	Exist. Lev/F w Ht	Total new Ht	R. High Bank	R. Freebd	Rqd FEMA Freebd	Rqd Extra R. Freebd	Gnd Elev	Exist. Lev/F w Ht	Total new Ht
	(cfs)	(ft)	(ft)		(ft)	(ft)	(ft)					(ft)	(ft)	(ft)			
23533	4750	324.00	330.85	334.0	3.15						334.0	3.15					
23333	4750	321.00	330.77	332.0	1.23						332.0	1.23					
23232	4750	320.50	329.45	330.0	0.55						330.0	0.55					
23216	4750	320.50	327.01	327.0	-0.01						328.0	0.99					
23159	4750	320.00	327.17	330.39	3.22						331.82	4.65					
23097	4750	320.00	327.04	330.39	3.35	4.00	0.6	330.4	0.0	0.7	331.82	4.78	4.00		331.8	0.0	
22933	4750	318.00	326.61	330.2	3.59	3.00		328.3	1.9		330.0	3.39	3.00		327.8	2.2	
22813	4750	316.50	325.63	330.0	4.37	3.00		328.1	1.9		332.5	6.87	3.00		324.6	7.9	
22311	4750	314.50	321.13	329.7	8.57	3.64		328.6	1.1		326.6	5.47	3.64		322.1	4.5	
22275	4750	315.00	321.11	325.0	3.89	4.00	0.1	325.0	0.0	0.1	326.5	5.39	4.00		326.5	0.0	
22215	4750	315.00	320.45	325.0	4.55	4.00		325.0	0.0		326.5	6.05	4.00		326.5	0.0	
22205	4750	315.00	320.33	327.1	6.77	3.90		326.0	1.1		326.5	6.17	3.90		317.8	8.7	
21808	4750	308.50	316.22	321.1	4.88	3.00		315.6	5.5		322.5	6.28	3.00		315.3	7.2	
21307	4750	304.50	312.54	317.8	5.26	3.00		311.0	6.8		318.5	5.96	3.00		312.0	6.5	
20805	4750	300.50	308.59	312.0	3.41	3.00		306.8	5.2		313.0	4.41	3.00		306.9	6.1	
20300	4750	296.50	304.81	308.0	3.19	3.00		303.3	4.7		307.8	2.99	3.00	0.01	301.7	6.1	6.1
19799	4750	292.50	300.93	304.2	3.27	3.00		299.5	4.7		304.9	3.97	3.00		297.2	7.7	
19296	4750	291.50	298.22	300.5	2.28	3.00	0.7	296.6	3.9	4.6	300.8	2.58	3.00	0.4	294.0	6.8	7.2
18933	4750	287.00	297.43	298.7	1.27	3.00	1.7	295.4	3.3	5.0	298.9	1.47	3.00	1.5	291.4	7.5	9.0
18787	4750	287.00	294.9	299.8	4.90	3.99		298.2	1.6		299.8	4.90	3.99		295.7	4.1	
18786	4750	287.00	295.1	300.0	4.90	4.00		300.0	0.0		297.5	2.40	4.00	1.6	297.5	0.0	1.6
18741	4750	287.00	293.61	300.0	6.39						297.5	3.89					
18740	4750	287.00	293.61	299.8	6.19						299.8	6.19					
18590	4750	286.00	289.06	291.0	1.94						299.4	10.34					

- Denotes Levee
- Denotes Bridge

Attachment B

Schematic Overview– Simplified plan view of Alamitos Creek with historic stationing; marked schematically with locations of existing levees and floodwalls and proposed levee, bridge and floodwall work. The approximate location of the Almaden Valley Pipeline is also schematically provided.

Attachment C Cost Estimates

Cost Estimate for Alamitos Conceptual Proposal					
Section 1: Estimate for onsite construction work based on proportionality to similar work (levee raising and floodwall raising) on San Francisquito Creek, 2002 averaged bids					
Alamitos work proportionately cost-estimated using: San Francisquito work @ 5,643 LF : Alamitos work estimated at 11,854 LF, with 3,059 LF of floodwall work and 8,795 LF of levee improvements					
Construction Costs, Avg'd San Francisquito Bids, 2002	**Quantity SF Ck 2002**	**Unit**	**$/LF SF Ck**	**LF Alamitos**	**Proportioned Cost Alamitos**
STORM WATER POLLUTION	1	LS	7.00	11,854	82,976
EXTRA SITE WORK AS DIRECTED BY THE ENGINEER	1	LS	17.72	11,854	210,066
MOBILIZATION	1	LS	26.74	11,854	316,997
CLEARING AND GRUBBING	1	LS	8.42	11,854	99,781
ASPHALT CONCRETE REMOVAL (trail)	1	LS	6.58	8,795	57,837
EXCAVATION	2,550	CY	84.96	11,854	1,007,107
LEVEE EMBANKMENT	4,130	CY	73.85	8,795	649,477
WALL CONSTRUCTION	501	CY	407.33	3,059	1,246,031
TEMPORARY 10-FT BARRIER FENCE	55	LF	0.83	11,854	9,878
TEMPORARY 8-FT BARRIER FENCE	490	LF	5.04	11,854	59,701
12-FT WIDE CHAIN LINK GATE	1	LS	0.32	11,854	3,781
CLASS 2 AGGREGATE BASE MATERIAL	1,960	TON	64.83	8,795	570,199
ASPHALT CONC. PAVEMENT reconstruct	220	TON	4.82	8,795	42,432
HYDROSEEDING	1	LS	1.20	11,854	14,179
					4,370,442
Subtotal, Proportioned Construction Costs: Increased to 2011 $'s using CPI 2003 - 2011 index Ref: http://www.bls.gov/cpi/tables.htm			**1.2557**		**5,487,964**
Section 2: Construction Costs, Not Proportioned to San Francisquito Work:					
Item (and source for estimate, if available)		**Unit**	**Unit Cost**	**No. Units**	**Cost**
Bridge Work					
feet wide) (cost based on 2007 Willow Glen Way bridge replacement at $600/SF)		SF	600	8,800	5,280,000
Pedestrian Bridge		LS	200,000	1	200,000
Traffic Control		LS	50,000	1	50,000

	Construction Sub-total, 2002 $'s						**11,017,964**
	Contingencies (Conceptual-Level; 40%, per 2010 Prelim. San Francisquito Creek Planning Study)						4,407,185.61
	Construction Management (Contractor) 10%						1,101,796.40
	Mitigation Costs (estimate 15% constr)						1,652,694.61
	Utility work/ relocations (estimate 5% constr)						550,898.20
	Total Construction Sitework Estimate (preliminary)						**18,730,539**
	Section 3: Right of Way - add'l needed for levee/floodwall work (unit cost based on SF Creek floodwall work, 2003)		SF	108		219,940	23,753,520
	Subtotal ROW and Construction						**42,484,059**
	Section 4: District Costs						
	Planning (15%)						6,372,609
	Design (10%)						4,248,406
	Environmental Review, CEQA (10% of Constr.)						4,248,406
	Geotechnical Studies for foundations and FEMA cert. (10% of Constr.)						1,101,796
	District Construction Inspection, CM, Engr. Support (10% of Constr.)						1,101,796
	Total Costs						**59,557,072**

Attachment D **Right-of-Way Estimates**

Alamitos Creek Levee/Floodwall Upgrade Quantities

Right-of-Way Requirements

Extra Levee Height (ft)	Extra ROW Width (ft)	From Sta	To Sta	Length	(ft)	(sq ft)
		Quantity				
0' to 2'	20	11119	13763	2644	3,505	70,100
		9687	10350	663		
		5787	5985	198		
2' to 4'	30	13763	15800	2037	3,502	105,060
		10350	11119	769		
		5985	6200	215		
		5592	5787	195		
		4343	4629	286		

Total Wall Height (ft)	Extra ROW Width (ft)	From Sta	To Sta	Length	(ft)	(sq ft)
		Quantity				
0' to 4'	0	8938	9365	427	2,157	0
		7442	8400	958		
		6306	7078	772		
4' to 7'	10	8400	8938	538	902	9,020
		7078	7442	364		

Total	**184,180**

Alamitos Creek U/S Levee/Floodwall Upgrade Quantities

Right-of-Way Estimates

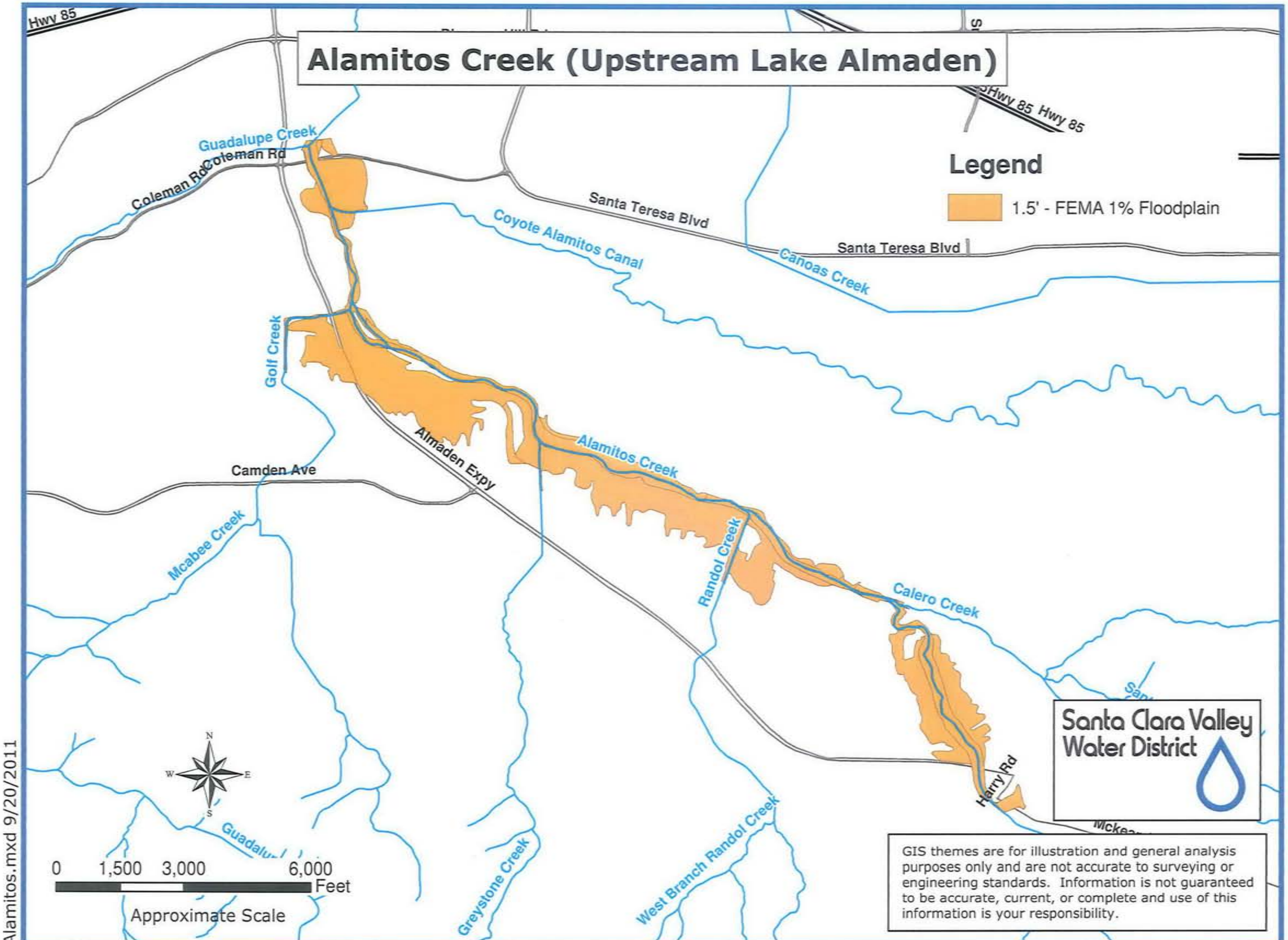
Extra Levee Height (ft)	Extra ROW Width (ft)	Quantity				
		From Sta	To Sta	Length	(ft)	(sq ft)
0' to 2'	20	22933	23097	164	1,788	35,760
		22215	22275	60		
		18787	19296	509		
		19799	20300	501		
		18787	19296	509		
		18741	18786	45		
2' to 4'	30			0	0	0
				0		
				0		
				0		
				0		

Total Wall Height (ft)	Extra ROW Width (ft)	Quantity				
		From Sta	To Sta	Length	(ft)	(sq ft)
0' to 4'	0			0	0	0
				0		
				0		
4' to 7'	10			0	0	0
				0		

Total	35,760

Attachment E

Map of 1% Floodplain (adapted from FEMA Digital Flood Insurance Rate Map, 2009)



Alamitos Creek (Upstream Lake Almaden)
Legend
1.5' - FEMA 1% Floodplain
Hwy 85
Hwy 85 Hwy 85
Guadalupe Creek
Coleman Rd
Coleman Rd
Santa Teresa Blvd
Santa Teresa Blvd
Coyote Alamitos Canal
Canoas Creek
Golf Creek
Almaden Expy
Alamitos Creek
Camden Ave
Mcabee Creek
Randol Creek
Calero Creek
Harry Rd
Greystone Creek
West Branch Randol Creek
Santa Clara Valley Water District
N
W
E
S
0 1,500 3,000 6,000 Feet
Approximate Scale
GIS themes are for illustration and general analysis purposes only and are not accurate to surveying or engineering standards. Information is not guaranteed to be accurate, current, or complete and use of this information is your responsibility.
Alamitos.mxd 9/20/2011

Upper Calera Creek (D/S Escuela Parkway to 1000 ft. U/S Hwy 680

FUTURE FUNDING DRAFT PROJECT PROPOSAL

Prepared By: Ed Drury

Ed Drury — June 14, 2011
Associate Civil Engineer
Water Resources Planning Division

Approved By:

Melanie Richardson — [Date]
Deputy Officer
Watershed Capital Division

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I. PROJECT BACKGROUND

A. Why do this Project?

FEMA and SCVWD studies indicate that portions of upper Calera Creek contribute to 1% flooding of approximately 1200 parcels in Milpitas. The proposed project would remove these from the flood plain.

B. History & Background

Calera Creek is a tributary to Lower Berryessa Creek. The Planning Study for Lower Berryessa Creek includes Calera Creek in its analysis and its recommended alternative for flood protection. The recommended alternative project for Lower Berryessa included three Calera Creek elements, the lower Calera Creek element, extending from the confluence with Berryessa Creek to 3000 feet upstream, and Upper Calera Creek elements 1 and 2 (upstream of the drop structure through Jose Higuera Adobe Park). Design and Construction of the lower Calera Creek element is included with the Lower Berryessa Creek Project through existing Clean Safe Creeks funding, but the Upper Calera Creek elements are not scheduled to be part of that project. The Upper Calera Creek portions will need to be constructed with funds that are not yet available.

This document pertains to the Upper Calera Creek elements 1 and 2, from Milpitas High School to Jose Higuera Adobe Park, upstream of Highway 680.

II. PROJECT OBJECTIVES

The objectives of the project are to:

- Provide flood protection for the design flood event
- Improve access for long-term channel maintenance
- Incorporate opportunities to integrate levees with the City of Milpitas trail system
- Identify opportunities for stream habitat enhancement and/or restoration

III. PROJECT CRITERIA / CONSTRAINTS / ASSUMPTIONS

- The project will provide a 1 percent level of flood protection to surrounding homes and businesses to meet FEMA criteria.
- The final design will provide for the City of Milpitas' planned recreational opportunities.
- The preferred alternative will improve maintenance access to the creek.
- The design will be consistent with the Stream Maintenance Program guidelines and activities for maintaining channel conveyance capacity.

Constraints:

- The Project will meet District standards for levee design and maintenance roads.
- There is limited land available to expand the existing right-of-way.
- The Project will coordinate with the City of Milpitas' recreational trail master plan.
- Construction within the creek channel can only occur between the months of April and October, per resource agency permit requirements.

Assumptions:

- The levees will be raised to provide adequate capacity to convey a 1 percent flood event.
- The project will require preparation of an EIR.
- Limited right-of-way will be purchased to construct the project.
- The construction cost estimates for the project alternatives carry the assumption that there will be zero cost for mitigation.

IV. PROJECT SCOPE OF WORK

Based on the Lower Berryessa Creek Planning Study, the upper Calera Creek project will design and construct the preferred alternative described in that document. The project will proceed from just downstream of Escuela Blvd. to approximately 1000 feet upstream of Hwy 680. The project will include 4300 feet of floodwalls, 1000 linear feet of concrete box channel construction, 300 linear feet of sheet piling and channel reconstruction.

Planning Phase:

- Review and identify potential issues with the preferred alternatives for each reach.
- Formulate the recommended project
- Perform appropriate public outreach
- Prepare the Engineer's Report and appropriate CEQA document.

Design Phase:

- Obtain right-of-Way.
- Determine and develop remediation protocols for any hazardous sites to include with plans and specifications.
- Develop plans and specifications for advertisement and award the construction contract.
- Coordinated utility and bridge design work with pertinent owners.
- Identify and obtain necessary permits from pertinent owners.
- Perform appropriate public outreach.
- Obtain necessary permits from regulatory agencies.
- Prepare Operations and Maintenance manual for channel improvements.

Construction Phase

- Construct the Project
- Perform appropriate public outreach.
- Manage construction contract

Closeout Phase

- Complete As-Built drawings.
- Close all contracts and agreements in accounting and the contract office.
- Conduct close out meetings and all other requirements identified in the Capital Project Delivery Procedure Q751D01.

V. PROJECT DURATION AND COSTS

Planning	1207 Project Management	$ 110	$ 25	$ -	$ -	$ -	$ -		$ 135
	1290 Planning Study	$ 220	$ 100	$ -	$ -				$ 300
Design	1321 Environmental Review /Regulatory Permit Acquisitions	$ -	$ 40	$ 60	$ 60				$ 160
	1407 Project Management		$ 25	$ 25	$ 25	$ 25			$ 100
	1493 Design & PS&E		$ 288	$ 460	$ 383	$ 19			$ 1,150
	1531 Land Acquisition				$ 2,000				$ 2,000
Construction	1607 Project Management					$ 70	$ 70	$ 60	$ 230
	1665 Construction Management and Engineering Support					$ 345	$ 690	$ 345	$ 1,380
	1660 Construction					$ 2,875	$ 5,750	$ 2,875	$ 11,500
Close-Out	1907 Project Management							$ 75	$ 75
Total Costs by Fiscal Year		$ 330	$ 478	$ 545	$ 2,468	$ 3,334	$ 6,510	$ 3,355	$ 17,020
Accumulated Costs		$ 330	$ 808	$ 1,353	$ 3,821	$ 7,155	$ 13,665	$ 17,020	$ 17,020

Costs shown in thousands

*FY1is planned to be __________

VI. SOURCES OF FUNDING

A. District Fund(s)

Clean Safe Creeks Funding from new program.

B. Potential Cost-sharing

There is currently no cost sharing opportunity for this project.

VII. OPERATING BUDGET IMPACTS

The project will be designed to reduce long-term operations and maintenance costs.

VIII. ESTIMATED LIFE CYCLE

The current estimate for project life is 50 years (to be verified during the design phase).

IX. LOCATION MAPS AND PHOTOS

The project consists of 2 elements shown on the next 2 pages:

Figure 1: Upper Calera Creek Element 1 and Reach Map

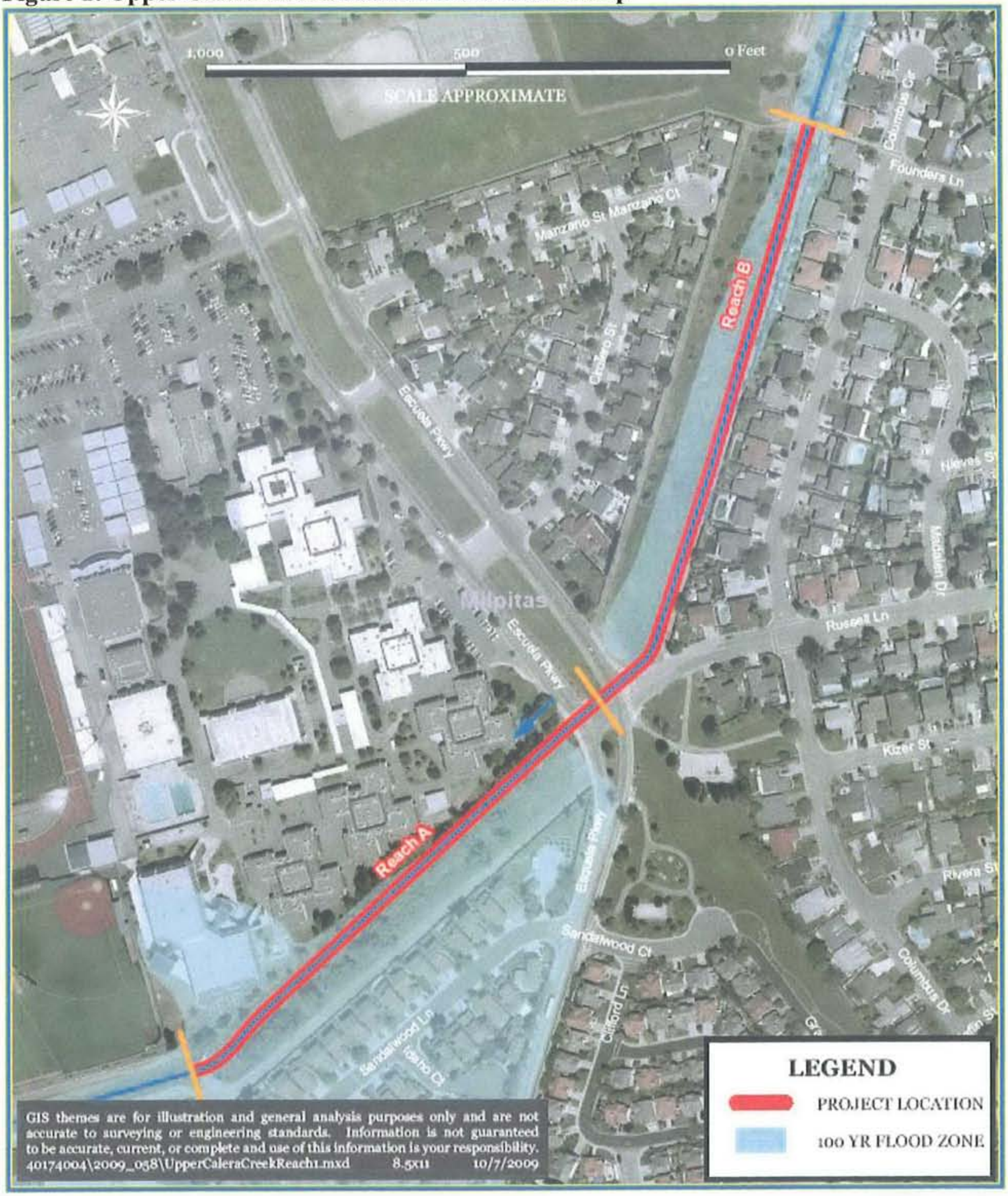

Figure 2: Upper Calera Creek Element 2 and Reach Map

CHANGE HISTORY

Date	Revision	Comments
9/12/2002	A	Initial Release
12/17/2002	B	The Guidelines were simplified, it was determined that revision A had too much detail required for a project proposal.
9/17/2003	C	Revised by CPSD Management Team.
6/4/2004	D	Step VIII. Location Map and Photos added.
1/28/2005	E	Text added to section I. B.
9/20/07	F	Benefits deleted from Section II, 'Estimated Life Cycle' added as Section VIII.
10/4/10	G	Task numbers in Section V. and cover sheet updated.

Mid Coyote Creek Reaches 6 through 8b

DRAFT PROJECT PROPOSAL

Prepared By:	
Ed Drury Associate Civil Engineer Water Resources Planning Division	June 16, 2011
Approved By:	
Melanie Richardson Deputy Officer Watershed Capital Division	[Date]

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I. PROJECT BACKGROUND

A. Why do this Project?

The Coyote Creek Project Study, called the Mid-Coyote Project, funded by Clean Safe Creeks, extends approximately 6.1 miles between Montague Expressway and Interstate 280, all in the City of San Jose. While the Mid-Coyote Project planning study covers the length from Montague Expressway to Berryessa Road, Reaches 4-8b, the construction portion of the project will only extend as far upstream as Hwy 880 (Reaches 4 and 5). This proposed project is intended to fund design and construction of the Hwy 880 to Berryessa Road portion, **Reaches 6-8b.**

The primary project objective is to enhance the creek's flow conveyance to protect homes, schools, businesses, and highways from the one-percent or greater flood frequency events, approximately 130 parcels, with a 1% damage estimate of $38M. Additionally, the project will evaluate opportunities to improve water quality, fisheries, habitat values, and public access.

B. History & Background

Coyote Creek has a long history of severe flooding in Santa Clara County. In 1995, creek improvements to provide a one-percent level of flood protection from Montague Expressway to San Francisco Bay, downstream of the Mid-Coyote Study reach, were completed by the District jointly with the Army Corps of Engineers–Sacramento District. Shortly after construction of the Lower Coyote Creek channel was completed, the improved channel safely conveyed the highest recorded flows since the construction of Anderson Reservoir. Without the project construction, these flows would have certainly over-banked the old levee system and again inundated the Alviso community, which has been flooded numerous times over the past 50 years. The project continues to function as designed and the 30+ acres of revegetation serve as a showcase for the District's environmental habitat improvements.

The next reaches upstream from the Lower Coyote project are reaches 4 and 5 which will be constructed under the Clean, Safe Creeks Mid-Coyote Project. Reaches 6 through 8b are included in the planning study of the Mid-Coyote Project, but are not funded for design and construction. The proposed project will fund the improvements up to Berryessa Road in San Jose.

II. PROJECT OBJECTIVES

The objectives of the project are to:

• Provide protection to the surrounding area from the one-percent flood event on Coyote Creek. Wherever feasible, the use of non-structural and/or minimal hardscape features will

be used for creek improvements. Only flooding from Coyote Creek within the project limits will be evaluated in this project effort.

- Mitigate for all project impacts to stream habitat values and fisheries.
- Identify stream habitat enhancement and/or restoration opportunities.
- Identify opportunities to improve water quality within the project limits.
- Identify opportunities to provide for public recreation and access.
- Minimize the need for future operations and maintenance activities and create a self-sustaining system within the completed project limits.
- Obtain community support.

During project development and implementation, the District will strive to incorporate the Board-approved Natural Flood Protection (NFP) objectives in achieving the project's overall goal and objectives. There are nine NFP objectives which were developed as a result of approval of the District's Clean, Safe Creeks & Natural Flood Protection Program. For the Mid-Coyote Creek project, the Coyote Watershed Manager has assigned a relative importance to each objective (1-10, ten being the highest).

The nine NFP objectives with their relative importance rating for this project are described below:

No. NFP OBJECTIVE	RELATIVE WEIGHT
1 Flood Protection: Focuses on providing protection to lives and property against the potential damages from large floods.	10
2 Ecology: Examines the potential to protect, enhance, or restore the natural resource benefits of streams and the watershed in ecological terms.	10
3 Geomorphology/Stable Channel: Addresses the ability to effectively manage the water and sediment from the watershed under both extremely high flows and routine low flows.	8
4 Maintenance: Focuses on minimizing the long-term obligation of operating and maintaining capital projects once they are constructed.	10
5 Watershed Context: Assesses how appropriate a project is to its location within the watershed and the physical, ecological, and social contexts.	9
6 Water Quality and Quantity: Addresses water-supply related goals, including quality and quantity of surface and groundwater associated with streams.	6
7 Local Partner Agencies: Measures how effectively a potential project meets goals of both the District and the partner communities affected	

by the project.	10
8 Community Benefits: Addresses the full range of community benefits beyond flood protection that might be integrated into a creek project.	10
9 Life-Cycle Costs: Examines project costs as a long-term investment rather than a one-time cost.	7

B. Project Benefits

Board Governance Policy E-2, Article 2.2 states, "There is reduced potential for flood damages." Based on projections produced by the District's Waterways Management Model, completion of the Mid-Coyote Project will protect an estimated 1,561 homes, 191 apartment buildings, 76 public facilities, and more than 200 commercial and industrial buildings in the surrounding area from the one-percent flood event. Flood damages from a one-percent event are estimated at $37.5 million (1999 dollars). It is important to emphasis that significant areas upstream of the Mid-Coyote Project reach are subject to flooding form Coyote Creek. The flood threat in those areas cannot be addressed until the Mid-Coyote Project improvements are constructed.

Board Governance Policy E-3, Article 3.1 states, "Watersheds, streams, and the natural resources therein are protected and when appropriate enhanced or restored." Project planning will provide for habitat, wildlife, and fisheries protections. Additionally, the project will provide for mitigation of project impacts, and, where appropriate, identify opportunities for enhancement of existing habitat values by increasing wetlands and riparian habitat. Opportunities for additional enhancements will be identified and submitted for the Board's consideration at the time of project approval.

Board Governance Policy E-3, Article 3.2 states, "There are additional open spaces, trails, and parks along creeks and in the watersheds when reasonable and appropriate." Project planning will attempt to provide for trail systems as identified in the City of San Jose's Trails Master Plan. Planning will also be consistent with the Collaborative Action Plan Agreement with the City for the development and operation of joint trail projects. Additionally, opportunities for open spaces or other recreational opportunities will be considered when evaluating project alternatives. For alternatives considered, proposed flood protection improvements will be developed to avoid precluding later establishment of trails or other compatible recreation features by the City.

III. PROJECT CRITERIA / CONSTRAINTS / ASSUMPTIONS

Project progress will be monitored by the Clean, Safe Creeks and Natural Flood Protection Independent Monitoring Committee composed of community leaders and interested residents appointed by the Board of Directors. It has four breakout sub-committees, one of which focuses on the flood protection objectives of the Program, which includes the Mid-Coyote Creek Project.

1. The existing hydrology documented in the District's 1976 Design Flow Manual will serve as the basis for design. This hydrology was the basis for the Lower Coyote Creek improvements downstream of this project. If new hydrology is completed, it will be evaluated for use in project design.

2. The Lower Coyote Creek improvements terminate at the downstream face of Montague Expressway. Those improvements have resulted in a lower design water surface elevation at the bridge which will be the starting water surface for the Mid-Coyote Creek Project.

3. Project operations and maintenance requirements documented in the August 30, 1994 Project Cooperation Agreement Between the District and the Army Corps of Engineers will remain in force, unless subsequently renegotiated and modified by the Corps and the District's Board of Directors. These conditions include, but are not limited to:

a. A limitation on the design flows allowed to be conveyed to the downstream project (downstream of Montague Expressway).

b. Operations of the District's upstream water conservation reservoirs are such that the downstream project design flows are not increased.

c. Changes to the downstream project facilities must be reviewed and approved by the Corps.

4. Recreational improvements are subject to Board approval and may be cost-shared with the City of San Jose.

5. Bridge replacements may be subject to cost-sharing by the City of San Jose, County of Santa Clara, or the State of California.

6. Project development will require significant public/community outreach to solicit input and a community outreach strategy will be developed.

7. The District will continue to pursue authorization for the Army Corps to initiate a Coyote Creek Watershed Study. The limits of that study would likely be the entire watershed, completely encompassing the Mid-Coyote Project limits.

8. Coyote Creek provides habitat for steelhead, a listed endangered species, and possibly other endangered species, which will require a formal consultation and biological opinion from the appropriate Federal regulatory agencies.

9. This project will require preparation of a full Environmental Impact Report (EIR) to comply with CEQA.

10. Project planning and implementation will focus on addressing the objectives within the project limits.

11. As much as possible, the project will utilize studies and findings developed through other District projects and programs. An example of this includes the 3 Creeks HCP, which addresses fisheries issues and barriers to fish passage.

IV. PROJECT SCOPE OF WORK

This project will perform all necessary work to prepare and complete the construction of the preferred alternative identified in the Mid-Coyote Creek Planning Study and include preparation of detailed design documents and construction of identified project elements. Work will be performed with the objectives of providing protection from the one-percent flood event, while improving stream values and habitat, and providing for appropriate recreational opportunities, between Hwy 880 and Berryessa Road. Upon completion of the project, an evaluation will be performed to determine the areas removed from the one-percent floodplain. This will determine if a Letter of Map Revision (LOMR) will be submitted to FEMA to revise the flood insurance rate maps, thus reducing the required insurance to local homeowners and businesses.

V. PROJECT DURATION AND COSTS

PHASE	MAJOR WORK ELEMENT	FY 1*	FY 2	FY 3	FY 4	FY 5	FY 6	FY 7	FY 8	Total
Planning	1207 Project Management	$ 110	$ 25	$ -	$ -	$ -	$ -			$ 135
	1290 Planning Study	$ 678	$ 678	$ -	$ -					$ 1,356
Design	1321 Environmental Review /Regulatory Permit Acquisitions	$ 39	$ 300	$ 200	$ -					$ 539
	1407 Project Management	$ -	$ 85	$ 85	$ 80	$ 80				$ 342
	1493 Design & PS&E		$ 949	$ 1,519	$ 1,266	$ 63				$ 3,798
	1531 Land Acquisition				$ -	$ 1,000				$ 1,000
Construction	1607 Project Management				50	$ 100	$ 100	$ 100	$ 200	$ 550
	1665 Construction Management and Engineering Support					$ 651	$ 1,085	$ 814	$ 705	$ 3,255
	1660 Construction					$ 5,425	$ 9,042	$ 6,781	$ 5,877	$ 27,125
Close-Out	1907 Project Management							$ -	$ 150	$ 150
Total Costs by Fiscal Year		$ 827	$ 2,038	$ 1,804	$ 1,396	$ 7,319	$ 10,227	$ 7,695	$ 6,932	$ 38,238
Accumulated Costs		$ 827	$ 2,865	$ 4,669	$ 6,064	$ 13,384	$ 23,610	$ 31,305	$ 38,238	$ 38,238

Costs shown in thousands

*FY1 is planned to be __________

VI. SOURCES OF FUNDING

A. District Fund(s)

New Clean Safe Creeks Program

B. Potential Cost-sharing

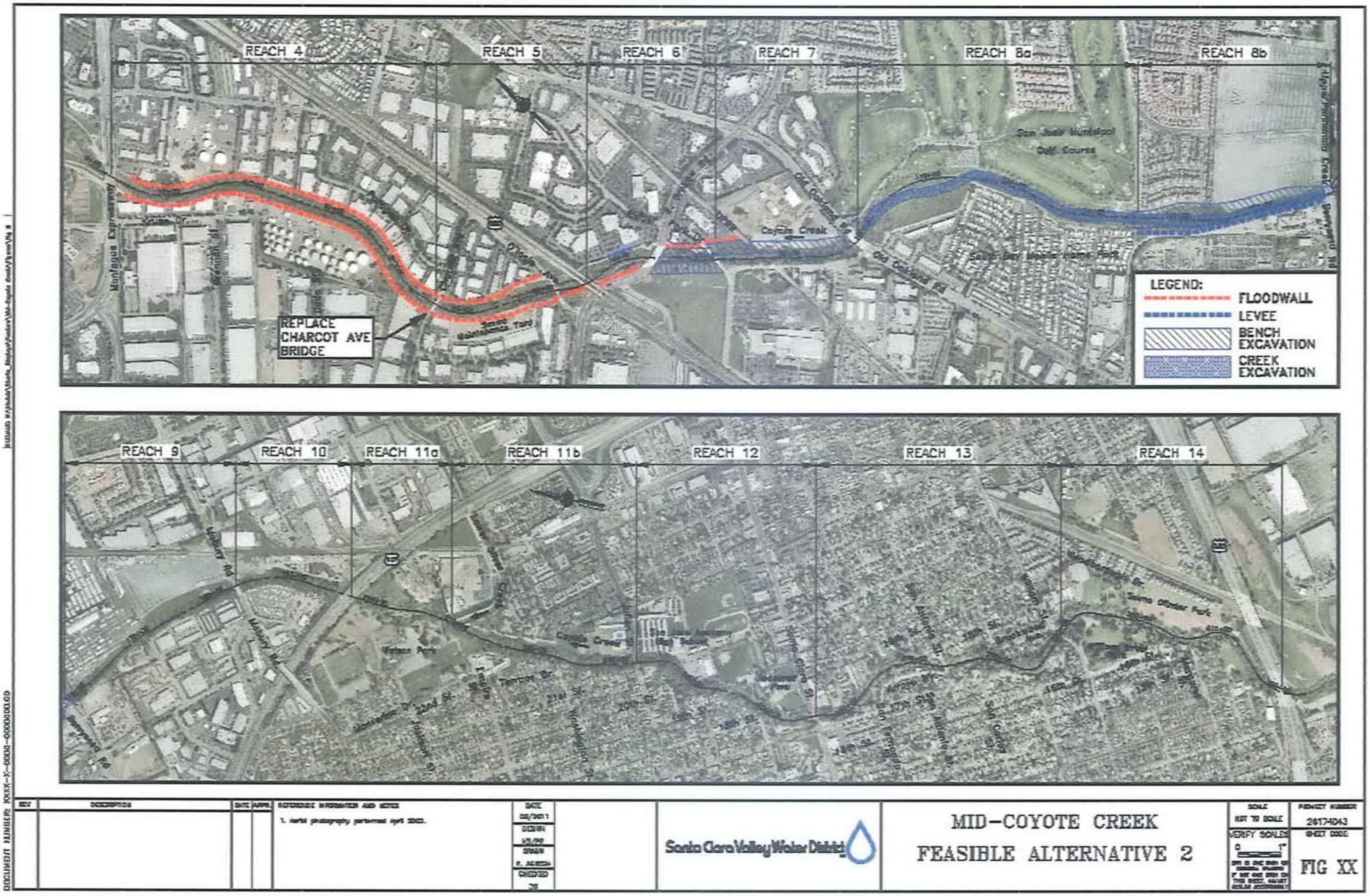
City of San Jose

VII. OPERATING BUDGET IMPACTS

VIII. ESTIMATED LIFE CYCLE

50 Years

IX. LOCATION MAPS AND PHOTOS


REACH 4
REACH 5
REACH 6
REACH 7
REACH 8a
REACH 8b
REPLACE CHARCOT AVE BRIDGE
San Jose Municipal Golf Course
Coyote Creek
Old Oakland Rd
LEGEND:
FLOODWALL
LEVEE
BENCH EXCAVATION
CREEK EXCAVATION
REACH 9
REACH 10
REACH 11a
REACH 11b
REACH 12
REACH 13
REACH 14
Watson Park
Santa Clara Valley Water District
MID-COYOTE CREEK
FEASIBLE ALTERNATIVE 2
26174043
FIG XX

CHANGE HISTORY

Date	Revision	Comments
9/12/2002	A	Initial Release
12/17/2002	B	The Guidelines were simplified, it was determined that revision A had too much detail required for a project proposal.
9/17/2003	C	Revised by CPSD Management Team.
6/4/2004	D	Step VIII. Location Map and Photos added.
1/28/2005	E	Text added to section I. B.
9/20/07	F	Benefits deleted from Section II, 'Estimated Life Cycle' added as Section VIII.
10/4/10	G	Task numbers in Section V. and cover sheet updated.

Permanente Creek Phase 2

PROJECT PROPOSAL

Prepared By:	Robert Vandenberg Associate Civil Engineer District-wide Asset Management Unit	6-16-2011
Approved By:		
	Melanie Richardson Deputy Administrative Officer Watersheds Capital Division Deputy's Office	6-16-2011

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I. PROJECT BACKGROUND

A. Why do this Project?

Recurrent flooding along Permanente and Hale Creeks presents a long term hazard to public health and safety, property values, and economic stability in the Cities of Los Altos and Mountain View. By 2016, the lower reaches of Permanente Creek, downstream of El Camino Real, will be protected from a 1% flood event through the District's Clean, Safe Creeks and Natural Flood Protection program. However, the area upstream of El Camino Real will not be protected by this project, due to limited funding. Hydraulic models of Permanente and Hale Creeks have shown that approximately 1,000 parcels in this upstream area would likely remain subject to shallow flooding in a one-percent event.

B. History & Background

The Clean, Safe Creeks Program of 2000 supported a Planning Study for the entire Permanente Creek watershed, as well as construction for a flood protection project that would provide flood relief for the lower portion of the watershed – downstream of El Camino Real.

This project, Upper Permanente, would be to construct flood protection measures for the upstream reaches of Permanente and Hale Creeks, which were studied but not funded for construction in Clean, Safe Creeks 2000.

The Permanente watershed has a history of recurring floods which have adversely impacted the safety and economic stability of the residents and businesses within the floodplain. Flooding in the watershed has been documented as far back as 1862. Other floods were recorded in 1911, 1940, 1950, 1952, 1955, 1958, 1963, 1968, 1983, 1995, and 1998.

II. PROJECT OBJECTIVES

- Follow the existing plan for the entire watershed that presents alternatives and a recommendation for providing flood protection for all flows up to the one-percent flood for Permanente Creek, Hale Creek, and the Permanente Diversion between Foothill Expressway and San Francisco Bay.
- Identify opportunities for environmental enhancement such as stream restoration, as well as trails, parks, and open space for the Board consideration.

- Provide flood protection to approximately 1,000 parcels from a 100-year flood, which would cause approximately $6.5 million in flood damages (as calculated by FEMA's HAZUS Flood Damage Calculation Software).
- Development of guidelines for the long-term maintenance of the facility.
- Minimize the cost for maintenance.

The project objectives address the following Board's Ends Policies:

- Ends Policy E-2.2, There is reduced potential for flood damages.
- Ends Policy E-3.2.1, Potential environmental enhancement opportunities are identified to the Board.

III. PROJECT CRITERIA / CONSTRAINTS / ASSUMPTIONS

A. Criteria

- Provide 1-percent flood protection.
- Obtain rights of way at least 6 months prior to the construction of each reach.
- Perform structural design work as per AISC standards.
- Coordinate utility relocation work as per District's and external agency's standards. District staff will be coordinating utility relocation work, which may include City of San Jose, San Jose Water Company, SBC Communications (Pacific Bell), Pacific Gas and Electric Company, various fiber optic and cable companies, etc.
- Conform to regulatory stipulations set forth by the Corps of Engineers Section 404 Permit, California Regional Water Quality Board's Section 401 Permit, and California Department of Fish and Game's Section 1601 Streambed Alteration Agreement.

B. Constraints

- Funding source for the project has to be determined.
- Design and coordination of utility relocations for each reach must be addressed and fully evaluated prior to construction.

C. Assumptions

- Planning will be completed under the existing Clean, Safe Creeks project by 2012. Additional Design will be completed 2 years after project approval, and Construction in 3 years.
- Appropriate permits will be obtained during the project's design phase.
- Cost for unforeseen negotiations with utility owners is not included in the current estimated cost.
- There is no federal interest for the project.

IV. PROJECT SCOPE OF WORK

The scope of this project includes implementation of, design, construction and closeout phases. The most recently updated QEMS procedures will be followed during execution of each phase.

A. Planning Phase (will be completed under existing Clean, Safe Creeks project).

- Identify the problems and issues.
- Evaluate and potentially expand on current feasible alternatives.
- Formulate recommended project.
- Perform appropriate public outreach
- Prepare Engineers Report and appropriate CEQA document.

B. Design Phase.

- Obtain rights of way.
- Determine and develop remediation protocols for hazardous sites and include with plans and specifications.
- Develop plans and specifications for advertisement and award of the construction contract.
- Coordinate utility work with pertinent owners.
- Identify and obtain necessary permit(s) from pertinent owner(s).
- Perform appropriate public outreach.
- Coordinate the design with the Permanente Creek Task Force.
- Obtain appropriate permits from regulatory agencies.
- Prepare Operations and Maintenance manual for channel improvements.

C. Construction Phase.

- Construct the project.
- Perform appropriate public outreach.
- Manage construction contract.

D. Close-out Phase.

- Complete as-built drawings.
- Close all contracts and agreements with accounting and contract office.
- Conduct close-out meetings and all other requirements identified in the Capital Project Delivery Procedure Q751D01.

A. PROJECT DURATION AND COSTS

This table shows cost estimates for the Upper Permanente project, the planning for which will be completed under the existing Clean Safe Creeks project.

The project elements included in the cost estimate for the portion upstream of El Camino Real are:

$10.2 – Hale Bypass
$8.2 - Channel Widening, reach H1

The detailed cost estimate is provided in Appendix E of the 2010 Planning Study, available here: .
http://www.valleywater.org/services/PermanenteCreekReportsandDocuments.aspx

PHASE	MAJOR WORK ELEMENT	FY 1*	FY 2	FY 3	FY 4	FY 5	FY 6	FY 7	FY 8	Total
Planning	1207 Project Management **	$ -	$ -	$ -	$ -	$ -	$ -			$ -
Planning	1290 Planning Study**	$ -	$ -	$ -	$ -					$ -
Design	1321 Environmental Review/Regulatory Permit Acquisitions	$ -	$ 100	$ -	$ -					$ 100
Design	1407 Project Management		$ 25	$ 25	$ 25	$ 25				$ 100
Design	1493 Design & PS&E		$ 200	$ 400	$ 400	$ 200				$ 1,200
Design	1531 Land Acquisition				$ -	$ -				$ -
Construction	1607 Project Management					$ -	$ 200	$ 100	$ 100	$ 400
Construction	1665 Construction Management and Engineering Support					$ -	$ 300	$ 200	$ 300	$ 800
Construction	1660 Construction					$ -	$5,000	$ 7,200	$ 6,200	$ 18,400
Close-Out	1907 Project Management							$ -	$ 50	$ 50
Total Costs by Fiscal Year		$ -	$ 325	$ 425	$ 425	$ 225	$5,500	$ 7,500	$ 6,650	$ 21,050
Accumulated Costs		$ -	$ 325	$ 750	$1,175	$1,400	$6,900	$14,400	$21,050	$ 21,050

~~*FY1 is planned to be 201X.~~

** Planning Study completed under existing Permanente Creek CSC Project.

The overall capital cost for the recommended project would be $21.1 million in 2008 dollars, including design, construction, and contingencies.

VI. SOURCES OF FUNDING

A. District Fund(s)

A source of funding for this project has not been identified.

B. Potential Cost-sharing

Currently there is no cost sharing opportunity for this project.

VII. OPERATING BUDGET IMPACTS

This project will be designed to reduce long-term operation and maintenance costs.

VIII. ESTIMATED LIFE CYCLE

The estimated project life is 50 years (to be verified during the design phase).

IX. LOCATION MAPS AND PHOTOS

TO BE INCLUDED BEFORE FINAL APPROVAL OF THIS PROPOSAL.

CHANGE HISTORY

Date	Revision	Comments
6-16-2011	A	Initial Release
	B	
	C	
	D	
	E	
	F	
	G	

Appendix K

Proposed Capital Natural Flood Protection Projects for Safe, Clean Water program (Goal 5)

List of proposed projects and funding level, as of October 31, 2011

Goal 5: **Provide Flood Protection to Homes, Businesses, Schools, Streets, and Highways**

Goal	Activity	Element*	SCW 2012 Funding 15-yr ($M)	Element Description
5	5.1 Complete Existing CSC Commitments (2012 - 2016)	5.1.1 Permanente Creek		See Clean Safe Creeks and Natural Flood Protection plan.
		5.1.2 San Francisquito Creek (Planning and design)		See Clean Safe Creeks and Natural Flood Protection plan.
		5.1.3 Sunnyvale West Channel		See Clean Safe Creeks and Natural Flood Protection plan.
		5.1.4 Sunnyvale East Channel		See Clean Safe Creeks and Natural Flood Protection plan.
		5.1.5 Upper Guadalupe River		See Clean Safe Creeks and Natural Flood Protection plan.
		5.1.6 Berryessa Creek		See Clean Safe Creeks and Natural Flood Protection plan.
		5. 1.7 Coyote Creek (Planning, design, partial construct.)		See Clean Safe Creeks and Natural Flood Protection plan.
		5.1.8 Upper Llagas Creek		See Clean Safe Creeks and Natural Flood Protection plan.
			$ 140.0	NOTE: This is the draft amount for CSC projects to be carried forward into the SCW Program.
	5.2 Proposed Capital Projects	5.2.1 Upper Penitencia (non-CSC Corps project)	$ 41.9	This project partners with the U. S. Army Corps of Engineers (COE) to plan, design, and construct improvements along 4.2 miles of Upper Penitencia Creek from the confluence with Coyote Creek to Dorel Drive.
		5.2.2 San Francisquito Creek, SF Bay to Middelfield Avenue	$ 26.2	This project is sponsored by the San Francisquito Creek Joint Powers Authority (JPA), of which the District is a member agency, in partnership with the U.S. Army Corps of Engineers (COE), to provide flood protection along San Francisquito Creek from San Francisco Bay to Searsville Dam.
		5.2.4 Upper Upper Berryessa (U/SHwy 680) Corps deleted this section	$ 29.0	This project completes construction on the uppermost section of the "Upper Berryessa" project, upstream of Highway 680.

Goal	Activity	Element*	SCW 2012 Funding 15-yr ($M)	Element Description
5	5.2 Proposed Capital Projects	5.2.5 Upper Llagas - Fund Federal Share	$ 59.0	This project continues a Clean, Safe Creeks 2000 project in partnership with the U. S. Army Corps of Engineers (COE) to plan, design, and construct improvements along 13.6 miles of channel extending from Buena Vista Ave. to Wright Ave., including West Little Llagas Creek.
		5.2.6 Shoreline Study	$ 5.0	The District is partnering with the California State Coastal Conservancy, the U. S. Army Corps of Engineers, and working with stakeholders to produce a feasibility study for improvements to the San Francisco Bay Shoreline.
*Elements organized by priority.		5.2 Subtotal	$ 161.1	

Appendix L

Details of Hydraulic Analyses

For Memorandum "Technical Analyses and Screening of Potential Flood Capital Projects for Safe, Clean Water Program"

Dated November 2, 2011

Volume 2 of 2

Appendix L – Details of Hydraulic Analyses is provided in a separate, bound volume containing notes and printouts from HEC-RAS runs for:

- San Tomas Aquino Creek
- Alamitos Creek
- Calera Creek
- Canoas Creek